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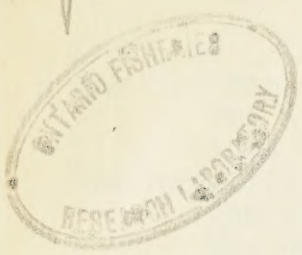


REPORT ON CULTURAL ACTIVITIES

UNDER THE

PRAIRIE FARM REHABILITATION ACT

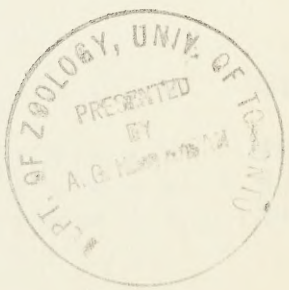
FOR THE FISCAL YEAR ENDING

MARCH 31, 1939.

EXPERIMENTAL FARMS SERVICE

DEPARTMENT OF AGRICULTURE

OTTAWA, CANADA



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REPORT ON CULTURAL ACTIVITIES

UNDER THE

PRAIRIE FARM REHABILITATION ACT

FOR THE FISCAL YEAR ENDING MARCH 31, 1939

FOREWARD

This report deals primarily with the cultural activities conducted by the Dominion Experimental Farms under the Prairie Farm Rehabilitation Act (P.F.R.A.) during the fiscal year 1938-39. Some references are made, however, to work done in preceding years, and to other than strictly cultural activities, in order to give a comprehensive outline of the cultural phase of the rehabilitation program.

THE PRAIRIE FARM REHABILITATION ACT

The Act

The Prairie Farm Rehabilitation Act (25-26 George V, C.23) was passed by the Parliament of Canada in April, 1935 "to provide for the rehabilitation of drought and soil drifting areas in the provinces of Manitoba, Saskatchewan, and Alberta". Under the terms of this Act measures have been introduced throughout the affected areas to promote those "systems of farm practice, tree culture, and water supply that will afford greater economic security" to the agricultural population. By an amendment made to the Act in March, 1937 (1 George VI, C.14), "land utilization" and "land settlement" were included as additional objectives. A later amendment, made in March 1939 (3 George VI, C. ..) removed the original five-year limit to the currency of Act.

Area Under the Act

The total land area coming under the provinces of the Prairie Farm Rehabilitation Act extends along the International Boundary from the Red River in Manitoba to the Rocky Mountains, south of an irregular line running from Winnipeg to Kamsack in Saskatchewan, thence northwest to Township 53 on the Saskatchewan - Alberta boundary, and thence southeast to the vicinity of Banff, Alberta. This line is more exactly shown in the map which accompanies this report.

Within the foregoing area are located approximately 172,000 farms, supporting a farm population of slightly over 700,000 persons. Occupied farm land in this area amounts to 79,000,000 acres, of which 47,000,000 acres have been improved. More complete statistics are presented in Appendix 1 on page 44.

THE PRAIRIE FARM REHABILITATION PROGRAM

The Need for Rehabilitation

The area coming under the provisions of the Prairie Farm Rehabilitation Act covers approximately 105 million acres of land. Within this area lie approximately 47,000,000 acres of improved farm land, representing approximately 55 per cent of the total improved acreage in Canada. In addition, the P.F.R.A. area contains about 27,000,000 acres of natural pasture lands.

By reason of the relatively dry climate, a very large percentage of the improved land in the P.F.R.A. area is utilized for the production of cereal crops, principally wheat. From 1921 to 1937 inclusive, this area produced 4,123,000,000 bushels of wheat,

2,538,000,000 bushels of oats, and 702,000,000 bushels of barley, the value of production in these three crops being in excess of 4,300,000,000 dollars. In addition to smaller quantities of other crops, this area has also produced large quantities of livestock, ranching being an important industry. In point of volume of production, the P.F.R.A. area constitutes the most important single agricultural area in Canada, and one of the major wheat producing regions of the world.

During recent years, beginning in 1930, farmers and ranchers within the P.F.R.A. area have suffered severe losses from a combination of low crop yields arising from drought and low prices for farm produce caused by economic depression. The area most severely affected by drought includes the following Crop Districts: No. 1 in Manitoba, Nos. 1, 2, 3, 4, 7 and 8 in Saskatchewan, and Nos. 1, 3, 5 and 7 in Alberta. Within this territory the average yield of wheat per acre declined from 16.0 bushels per acre for the favourable years, 1921 to 1929 inclusive, to only 8.6 bushels per acre for the drought period 1930 to 1937 inclusive. For the same periods the average farm price of wheat dropped from 95 cents to 60 cents per bushel. These factors in combination have caused a shrinkage of nearly 70 per cent in farm income from wheat alone, while similar conditions have obtained with other lines of agricultural production. Furthermore, frequent crop failures, arising from drought and insect depredations have left extensive tracts of land inadequately protected by vegetative cover against wind erosion, and heavy damage to soils from drifting has resulted. An additional depressive factor has been the prevalence of cereal rusts, which have frequently destroyed otherwise promising crops. Altogether, the drought area of the Prairie Provinces has experienced an agricultural depression of unprecedented severity and duration.

The adverse effects of the foregoing conditions on the social and economic life of the prairies have led to the introduction of various remedial measures by the provincial and federal governments. The Prairie Farm Rehabilitation program, designed in the light of recent experiences to bring about desirable adjustments in agricultural practice, was inaugurated by the Dominion government in recognition of the national importance of the prairie drought problem.

The Rehabilitation Program

Object - The principal object of the rehabilitation program is to enable farmers throughout the drought area to remedy the effects of drought and soil drifting, and to effect such improvements in farm practices and land use as will afford the greatest possible degree of security to prairie agriculture against future droughts or other crises. An essential feature of this program is the encouragement and assistance given to farmers to solve their own drought and soil drifting problems by co-operative community action, with a minimum of material and financial aid from governmental sources. For this reason the cultural side of the rehabilitation program is largely demonstrational and fact finding, with the object of supplying guidance for the readjustment of agriculture, rather than to provide assistance in bridging temporary difficulties.

Cultural - With the foregoing general objects in view, measures have been introduced throughout the drought and soil drifting areas to ensure the most economical utilization of the limited supply of soil moisture for crop production, to prevent soil drifting, and to reclaim abandoned farm land for its most suitable use in either crop production or grazing. This phase of the program is being accomplished by the Dominion Experimental Farms through demonstrational and investigational work on District Experiment Sub-Stations and Reclamation Stations, while the interest and co-operation of farmers is being secured through Agricultural Improvement Associations. The

value of drought resistant, soil-binding grasses for reclamation and soil drifting control is being demonstrated through numerous regrassing projects. These projects are especially timely in connection with the provincial land utilization policies of Saskatchewan and Alberta. Tree planting as a drought and soil drifting control measure is being promoted on a large scale for both demonstrational and experimental purposes.

Land Utilization - Latterly, land utilization studies based on economic land ownership and soil surveys, have been undertaken with a view to establishing a better relationship between farming practices and soil conditions. A practical development of these studies is the establishment of community pastures on areas of sub-marginal land which have been at some time unsuccessfully cultivated. The permanent removal of these lands from cultivation and their use for grazing under government control will effect desirable improvements in land utilization. A similar measure consists of designating large areas of marginal land as reserve pastures, in which ranching rather than grain farming will be promoted.

Water Development - A major phase of the program is the development of surface water resources, with a view to securing the most effective utilization of the limited water supplies for irrigation, stock-watering, and domestic farm purposes.

Land utilization and water development activities are supervised by the Director of Rehabilitation, Prairie Farm Rehabilitation Office, Regina, Sask., assisted by the Superintendents of Land Utilization and Water Development.

Organization of Cultural Work under the Rehabilitation Program

The cultural phases of the rehabilitation program are under the general supervision of the Director of the Dominion Experimental Farms. Regional and special activities are supervised as follows:

Regional

1. Southwestern Manitoba - Dominion Experimental Farm, Brandon, Man.

2. Southeastern Saskatchewan - Dominion Experimental Farm, Indian Head, Sask.

3. Southwestern Saskatchewan - Dominion Experimental Station, Swift Current, Sask.

4. Central Saskatchewan and East Central Alberta - Dominion Experimental Station, Scott, Sask.

5. Southern Alberta - Dominion Experimental Station, Lethbridge, Alta.

Special

Tree Planting - Forest Nursery Station, Indian Head, Sask.

Soil Research - Soil Research Laboratory, Dominion Experimental Station, Swift Current, Sask.

Soil Survey and Cooperative Soil Research - Soil Departments, Universities of Manitoba, Saskatchewan and Alberta.

Forage Crops Research - Dominion Forage Crops Laboratory, Saskatoon, Sask.

THE PROGRESS OF CULTURAL WORK UNDER THE PRAIRIE FARM REHABILITATION ACT FISCAL YEAR - 1938-39

Weather and Crop Conditions during the Growing Season of 1938

Weather and crop conditions in the Prairie Provinces during the past season, while not altogether satisfactory, have been much more favourable than in 1937. In 1937, it will be remembered, disastrous conditions of drought and crop failure were experienced throughout practically all of Saskatchewan and in the east-central area of Alberta. During 1938, however, at least some crop has been harvested in all parts of the Prairie Provinces.

In Manitoba, during 1938, fairly good yields of wheat were secured, although some reduction was caused by drought and rust in the southwestern area.

Throughout Saskatchewan, the yield of wheat was somewhat low, especially in the southern areas and in the extreme north. In southeastern Saskatchewan the yield of wheat over a large area was reduced by rust and grasshoppers to five bushels or less per acre. Similar conditions of low wheat yield were caused by drought in the Saskatoon-Battleford-Prince Albert triangle in the north.

Fairly good to good yields of wheat were secured throughout Alberta, with the exceptions of the Special Areas in the east-central portion of the province, and in the Peace River district.

In the following table is presented the estimated yield of wheat per acre secured during 1938 in each of the three Prairie Provinces, in comparison with the yields secured in 1937, and with the average yields for the 27 years ending in 1936.

Average Yield of Wheat per Acre - Prairie Provinces

Data published by Dominion Bureau of Statistics

Period	Manitoba	Saskatchewan	Alberta
	bu.	bu.	bu.
1938	16.0	9.6	17.9
1937	15.7	2.6	9.7
Average 1910 to 1936 inclusive	16.0	14.9	17.7

Dominion Experimental Farms

Rehabilitation activities conducted during 1938, under the supervision of the Dominion Experimental Farms at Brandon, Man., Indian Head, Sask., Swift Current, Sask., Scott, Sask., and Lethbridge, Alta., are described below on pages 5 to 32 under the following headings:

District Experimental Sub-Stations
Reclamation
Regrassing Demonstrations
Regrassing on Community Pastures
Grazing Surveys
Soil Moisture Conservation
Irrigation Development
Agricultural Improvement Associations

District Experiment Sub-Stations

District Experiment Sub-Stations are the principal agencies through which the investigational and demonstrational facilities of the Dominion Experimental Farms are being utilized for the improvement of agricultural conditions in the drought and soil drifting areas. Comprising usually about 640 acres of land each, these sub-stations are private farms which are operated under government supervision for the demonstration and further trial of the best known methods of crop production in districts subject to drought and soil drifting. One noteworthy feature of this work is that the average sub-station has no advantages in land or equipment over many other farms in the district, and is therefore free from the objection often attached to the larger experimental farms that the measures employed are beyond the resources of the ordinary farmer. Moreover, as there are 52 sub-stations located at strategic points throughout the drought area, they cover a very wide range of soil and weather conditions, a factor of great importance in experimental work.

The location by general districts of the 52 sub-stations in operation on March 31, 1939, is shown in the following list. During the past year five new Sub-Stations were established at the following points: Hargrave, Man.; Shackleton, Sask.; Acadia Valley, Alta.; Craigmyle, Alta.; and Nobleford, Alta.

District Experimental Sub-Stations

Operating under the Prairie Farm Rehabilitation Act

as of March 31, 1939

Southwestern Manitoba

Boissevain	Goodlands	Lyleton
Crystal City	Hargrave	Pipestone

Southeastern Saskatchewan

Alameda	Davidson	Weyburn
Arcola	Lisieux	Willowbunch
Avonlea	Radville	Strasbourg
Aylesbury (formerly Craik)		

Southwestern Saskatchewan

Canuck	Kincaid	Shackleton
Carmichael	Limerick	Shaunavon
Fox Valley	Parkbeg	Tompkins
Gravelbourg	Piapot	Tugaske
Herbert	Riverhurst	Valjean

West Central Saskatchewan and Central Alberta

Consort, Alta.	Juniata, Sask.	Metiskow, Alta.
Dunblane, Sask.	Kindersley, Sask.	Rosetown, Sask.
Guernsey, Sask.	Loverna, Sask.	

Southern Alberta

Acadia Valley	Craigmyle	Pincher Creek
Bindloss	Drumheller	Rockyford
Castor	Foremost	Whitla
Cessford	Lomond	
Claresholm	Nobleford	

The location of these Sub-Stations is shown on the map on page 50 of this report.

In view of the fact that conditions on the District Experiment Sub-Stations are typical of the drought and soil drifting area as a whole, and the remedial and preventive measures being adopted on these stations are of general application, the following description of sub-station operations is representative of the improvements in crop production being introduced under the rehabilitation program.

Cropping Practices - The principal limiting factor governing crop production in drought areas is the lack of sufficient soil moisture, which is sometimes totally inadequate for economical crop production. This condition profoundly affects cropping practices, limiting the choice of crops to the relatively drought-resistant grains, principally wheat, and requiring special measures to effect the optimum utilization of the available soil moisture. For this reason, a two-year rotation of summer-fallow and grain is uniformly practised on all District Experiment Sub-Stations, moisture being stored in the soil during the fallow years to supplement rainfall deficiencies during the crop years. On some sub-stations a three-year rotation of summer-fallow, grain, grain, is also followed for comparison with the two-year rotation. An important function of the summer-fallow is to destroy weeds which would otherwise utilize the scanty soil moisture supplies to the detriment of the grain crops.

Soil Drifting Control - During recent dry years soil drifting has resulted in severe damage to extensive areas of soil throughout the southern parts of the Prairie Provinces. This tendency to drifting arising from the action of high winds on soil which is relatively poor in plant fibre, is increased by the necessary practice of summer-fallowing which exposes the soil without vegetative protection, and in a more or less pulverized condition. Under conditions of severe drifting, the surface soil is blown into drifts, thereby interfering gravely with the tillage operations, and leaving areas of the subsoil exposed, with a serious reduction in fertility. As soil drifting has assumed unprecedented proportions during recent years, several measures of control including strip farming, cultural practices and cover crops are being tested and demonstrated on the District Experiment Sub-Stations.

Strip farming is a method of reducing drifting on fallow land to a minimum by alternating long, narrow strips of summer-fallow with similar strips of growing crops. These strips, ranging in width from 4 to 16 rods, are run at right angles to the prevailing strong winds. Drifting which may occur on the fallow strips is checked by the alternate crop or stubble strips, thereby limiting the damage to a confined area.

Strip farming has proved very effective in checking soil drifting in some localities, particularly in southern Alberta. For this reason, part of the grain on each sub-station is grown in strips, with the object of introducing this practice in districts where it has not been previously tried. In many districts throughout Saskatchewan and Alberta strip farming was first practised on the local sub-stations. At Avonlea, strip farming was adopted on the local illustration station in 1932, and was already well established when this station was enlarged into a sub-station in 1935.

Cultural practices in the preparation of land for seed, especially on fallow, have considerable influence on the readiness with which soil drifts. Experience has shown that drifting on cultivated land is less likely to occur where a good "trash" cover of stubble and dead weeds is retained on the surface, than where this material is completely buried. Good trash cover is maintained by shallow cultivation including the "ploughless" fallow in which the seed bed is prepared without ploughing.

Cultivation which leaves the surface in a rough, cloddy condition is a useful control measure, which has given very promising results on the sub-stations. Under conditions of emergency, drifting may be checked by ploughing furrows at intervals of a few rods across the affected area at right angles to the direction of drifting, or by using the duckfoot cultivator or lister in a similar manner.

On each District Experiment Sub-Station various cultural practices are being compared with a view to determining those which are most suitable to control drifting under local conditions.

Cover crops of fall sown spring grain are being used on part of the summer-fallow land on each sub-station to prevent fall and spring drifting. This practice may be followed in conjunction with strip farming or on large fields. As cover crops are usually sown about the first of August they do not make sufficient growth before freeze-up to greatly reduce the moisture conserved during the previous period of bare fallow. Where rainfall is sufficient to produce fair growth, cover crops may prevent soil drifting, provide some grazing and retain a snow cover against winter winds.

In some cases drifting on fallow land may be controlled by growing corn in single rows at about two-rod intervals or by drill-width strips of hemp at about four-rod intervals, the seeding being done at right angles to the prevailing strong winds. A combination of strip farming, together with the use of surface cultivation to maintain a trash cover, has proved quite effective in the control of soil drifting.

Farmstead improvements - On all District Experiment Sub-Stations certain measures are undertaken to improve living conditions around the farm home. These measures include the establishment of farm home shelterbelts of trees and hedges, for the protection of buildings and home surroundings against high winds and drifting soil. Provision is also made for farm gardens; poultry flocks are established or improved, and efforts are made to maintain some live stock. One result of these measures is to provide a supply of foodstuffs for domestic use, which tends to offset the hardships caused in periods of low field crop production.

Grass and clovers for hay and pasture - On sub-stations where conditions are favourable to the production of hay or pasture, efforts are made to establish stands of desirable grasses or clovers. Preference in this work is given to relatively drought resistant species, notably crested wheat grass, brome grass, and sweet clover. In some areas alfalfa is grown on low land. One result of this work will be to determine the most suitable grasses or clovers for various districts, as well as the economic feasibility of cultivated hay or pasture seedings.

PROGRESS OF WORK ON DISTRICT EXPERIMENT SUB-STATION DURING 1938

Sub-Station Work in Southwestern Manitoba

District Experiment Sub-Stations have been established at six points in southwestern Manitoba, namely, Boissevain, Crystal City, Goodlands, Lyleton, Pipestone, and Hargrave. The Sub-Station at Hargrave was established in March, 1938, in territory recently brought under the P.F.R.A.

Climatic conditions and crop growth - Crop yields varied greatly in 1938 throughout the "drought area" of southwestern Manitoba, due to the fact that some districts received local showers during the summer while other districts suffered from inadequate precipitation. June rainfall was considerably below normal.

The yield of wheat per acre secured on Sub-Stations was as follows: Boissevain, 15.6 bushels; Crystal City, 12.2 bushels; Goodlands, 16.3 bushels, Lyleton, 13.1 bushels; Pipestone 5.3 bushels.

Soil drifting control - Strip farming, combined with proper cultural practices, has proved successful in controlling soil drifting on Sub-Stations in southwestern Manitoba. From the results of strip farming experiments on Sub-Stations certain tentative conclusions may be drawn. To secure economy of farm operations and maximum protection against insect depredations, strips should be as wide as possible, consistent with effective drifting control. Observations on Sub-Stations indicate that the most satisfactory width of strip for southwestern Manitoba ranges from 13 rods on light soil to 20 rods on heavy soil. Direction of stripping is also important, but so far no definite conclusions can be drawn from results secured in south-western Manitoba. At Pipestone, during 1937, summerfallow on the north to south strips drifted more than on the east to west strips, while the reverse was the case in 1938.

Experiments on Sub-Stations indicate that cultivation without ploughing gives better control of drifting on summerfallow land in southwestern Manitoba, than does ploughing. The ploughless fallow retains more trash on the surface than does ploughing and, therefore, affords greater protection against drifting. Moreover, the ploughless fallow is less costly than the ploughed fallow. So far, no significant difference in yields attributable to these treatments has been observed in southwestern Manitoba. Disadvantages of the ploughless fallow are; excessive pulverization and retention of weed seeds in the surface layer of the soil with subsequent infestation of grain crops.

Crop rotations - Experiments to determine the best rotations for varying soil and climatic conditions are in progress on the Sub-Stations in southwestern Manitoba. Part of the land in each Sub-Station is under a two-year rotation of summerfallow and wheat. This rotation has proved fairly satisfactory, excepting on light land at Pipestone where only a limited amount of moisture can be retained in the gravel sub-soil and where the summerfallow land is predisposed to drifting.

Three and four year rotations with one year in summer-fallow and in some cases one year in hay, have given promising results. Owing to the short period for which results are available, however, definite conclusions should be deferred.

Fertilizer trials - The application of about 40 pounds of ammonium phosphate (16-20) in 1938 to wheat on fallow on five sub-stations in no case produced increased yield sufficient to pay for the cost of the fertilizer.

Forage crops - The production of forage crops, both for feed and soil improvement, is an important phase of Sub-Station work in southwestern Manitoba. For this purpose, sweet clover has shown general usefulness for feed, soil enrichment, and drift control. Alfalfa has grown well on light soil where the water table remains within six to eight feet of the surface. Brome grass continues to be one of the dependable perennial grasses for southwestern Manitoba. While the value of crested wheat grass for pasturing in this district has not yet been determined, little difficulty has been experienced in securing stands. Corn, in recent years, has been securing increasing recognition for the production of both feed and seed.

Gardens - Fairly good results were secured in 1938 on all Sub-Station gardens. Fruit trees, supplied by the Dominion Experimental Station at Morden, Man., are on trial at Goodlands and Lyleton Sub-Stations.

Meetings - During the summer, field days for farmers were held at the Pipestone, Crystal City and Goodlands Sub-Stations, with an average attendance of 175.

In February, 1939, a two-day conference for the operators of District Experiment Sub-Stations representatives of the Agricultural Improvement Associations in southwestern Manitoba, was held at the Dominion Experimental Farm, Brandon, Man. A number of subjects pertinent to the rehabilitation program was discussed. This meeting greatly stimulated interest in the co-operative work carried on under the P.F.R.A.

Sub-Station Work in Southeastern Saskatchewan

District Experiment Sub-Stations in southeastern Saskatchewan are located at ten points, namely, Alameda, Arcola, Avonlea, Aylesbury (Craik), Davidson, Lisieux, Radville, Strasbourg, Weyburn and Willowbunch. No new Sub-Stations were established during the past year.

Climatic and Crop Conditions - Fairly good rains in the fall of 1937 and in the following May, together with warm spring weather, stimulated the early growth of crops in most districts of southeastern Saskatchewan, thereby reducing to a minimum the danger of soil drifting. Precipitation was below normal at Alameda, Avonlea and Aylesbury, and apparently resulted in low crop yield.

In spite of a serious rust epidemic which appeared in early July, and of heavy grasshopper attack, fairly good yields of crops were secured on most of the Sub-Stations. Grasshopper damage, which caused considerable reductions in yield at Alameda, Arcola and Weyburn, extended much farther north in 1938 than in any previous year. No frost injury was reported in the spring or fall.

Soil drifting control - The control of soil drifting by strip-farming, supplemented by proper cultural practices is the principal object of experimental work on Sub-Stations in southeastern Saskatchewan. The standard width of strip on these Sub-Stations is 16 rods, with narrower strips where warranted by local drifting conditions.

The adoption of strip farming by farmers is making considerable headway where drifting has been severe, as in the districts adjacent to the Willowbunch, Lisieux, Avonlea, Arcola and Radville Sub-Stations. In some other districts, where the farmers by careful cultural practices have prevented drifting on large fields, the spread of strip farming has been decidedly slow.

It is interesting to note that on the Avonlea Sub-Station, which was an Illustration Station of the Dominion Experimental Farms prior to 1935, strip farming for drift control was in use as early as 1932. In general, however, strip farming was introduced to eastern Saskatchewan by the Sub-Stations established under the rehabilitation program.

It is very important in soil drifting control to supplement strip farming with suitable cultural methods for the summerfallow strips. On the Sub-Stations in southeastern Saskatchewan, the "ploughless fallow" has been found useful, especially where weeds or stubble provided a desirable trash cover to check surface drifting. Where little or no trash has been available, as in the extremely dry year of 1937, ploughing to produce a lumpy surface has given better control of drifting than cultivating only.

Cover crops - Cover crops of spring grain, sown on summerfallow land in early fall at about one-half bushel per acre, have been used in some districts of Western Canada to prevent drifting during the late fall and early spring. In southeastern Saskatchewan, this method has failed in each of the four successive years since 1934, largely due to grasshopper attack. Cover crops sown in 1938 on the Sub-Stations at Lisieux, Willowbunch and Strasbourg, proved complete failures.

Crop rotations - On all Sub-Stations in southeastern Saskatchewan, the limited supply of soil moisture is the most important factor affecting crop production. For this reason, the rotations followed on the Sub-Stations consist largely of the two-year summerfallow crop, and the three-year summer-fallow crop sequences. The two-year rotation is very suitable for strip farming, and results in greater conservation of moisture than do rotations of longer duration.

Very low precipitation in 1937 had the effect in 1938 of depriving summerfallow land of any advantage in stored moisture as compared with stubble land. As a result, yields of wheat on stubble land were practically as high as on summerfallow.

The difficulty of securing stands of perennial hay crops in southeastern Saskatchewan has been so great as to prevent their inclusion in crop rotations. Oats, spring and fall rye and Colsess barley are grown for forage. Corn, as a summerfallow substitute, is used on seven Sub-Stations.

Live Stock - Some live stock is kept on each Sub-Station in this district, and in spite of the feed famine of 1937, considerable progress is evident in breeding developments. The herds of cattle on eight of the Sub-Stations are headed by pure-bred bulls. Pure-bred stallions are kept on three Sub-Stations. Although tractors are used to a considerable extent for field work some work is done by horses. Encephalomyelitis caused some loss of horses in 1938. No sheep are kept on any of the Sub-Stations.

Farm gardens - A farm garden is a feature of the work on each Sub-Station. During 1938, all gardens were productive, especially as regards tomatoes and potatoes. The appearance of the dwellings has been enhanced by annual and perennial flowers. Experiments in growing fruit trees are in progress.

Field Days - During 1938, field days for farmers were held at eight Sub-Stations, with an average attendance of 181. The staff members of the Experimental Farm, the Forest Nursery Station, Indian Head, and the Entomological Laboratory, gave talks to the farmers at these meetings.

Sub-Station Work in Southwestern Saskatchewan

Fifteen District Experiment Sub-Stations have been established in southwestern Saskatchewan. These Sub-Stations are located at Canuck, Carmichael, Fox Valley, Gravelbourg, Herbert, Kincaid, Limerick, Parkbeg, Piapot, Riverhurst, Shackleton, Shaunavon, Tompkins, Tugaske, and Valjean. One new Sub-Station, at Shackleton, was established during March, 1939.

Climatic conditions and crop growth - Weather conditions were fair for crop production in most of southwestern Saskatchewan during the past year. Very little soil moisture was carried over from 1937, but winter snowfall and summer rainfall were generally sufficient for fairly good crop growth. High temperatures in midsummer, however, caused reduction in yields on some Sub-Stations, while wheat stem rust and grasshoppers resulted in some losses. Little severe damage from soil drifting was experienced. On one Sub-Station only, at Herbert, did conditions of crop failure prevail.

Cropping and cultural practices - The demonstration of strip farming for soil drifting control on Sub-Stations, has led to the widespread adoption of this practice in southwestern Saskatchewan. In a survey of some eleven townships made in the spring of 1938, it was found that 63.1 per cent of the cultivated land was under strip farming, and it was estimated that a similar percentage of the land throughout the crop producing areas of this district is under strip farming. In this manner, the Sub-Stations together with the Reclamation Stations and Agricultural Improvement Associations have contributed materially to the reduction of soil drifting.

Experiments conducted on the Sub-Stations, however, have demonstrated that correct cultural practices in combination with strip farming, are essential for drift control. In general, surface cultivation without ploughing is preferable to ploughing in the tillage of summerfallow land. After such dry years as 1937, however, when little stubble or trash is present to check drifting, spring ploughing for seed bed preparation has proved superior on many Sub-Stations to surface cultivation only. Under such conditions, ploughing has been found to bury the very loose layer of surface soil, and to bring up sub-surface soil which retains a partially puddled drift-resistant condition, long enough to permit some growth of the crop.

During 1938, fertilizer tests were conducted on nine Sub-Stations in this district but, as a whole, without significant results.

Wheat variety tests - Wheat variety tests were conducted on 13 Sub-Stations during 1938. In these tests the new rust resistant Regent variety outyielded all other varieties compared, including Marquis, Thatcher and Renown.

Distribution of registered seed from Sub-Stations - Some of the Sub-Stations in this district serve as centres for seed grain improvement. During 1938 registered seed was sold from Sub-Stations to the extent of 7000 bushels of Marquis wheat and 800 bushels of Dakold fall rye.

Poultry - The raising of poultry for demonstrational purposes is promoted on all Sub-Stations breeding stock being supplied from the Dominion Experimental Station at Swift Current. During the past year some 7000 hatching eggs, 100 cockerels and 50 pullets were distributed from Sub-Stations to neighbouring farmers.

Gardens - Home gardens on Sub-Stations gave very good results in 1938, although some damage was done by grasshoppers. On the Canuck Sub-Station water for garden irrigation was provided from a P.F.R.A. dam.

Field meetings - During the summer a field meeting was held at each Sub-Station with a total attendance of 2400 farmers.

Sub-Station Work in East Central Saskatchewan and Central Alberta

There are eight District Experiment Sub-Stations in the P.F.R.A. area supervised from Scott. These Sub-Stations are located at Dunblane, Guernsey, Juniata, Kindersley, Loverna, and Rosetown in Saskatchewan, and at Consort and Metiskow in Alberta. No new Sub-Stations were started during the past year.

A wide range of experimental work is conducted on these Sub-Stations, in an endeavour to determine the best methods to combat drought, soil drifting, weeds, and insect infestations. Considerable attention is given to growing legumes and grasses for soil improvement and the production of forage. Minor phases of production, such as live stock, poultry, gardening and home beautification, are promoted by demonstration.

Climatic and crop conditions - Heavy snowfall was received throughout the Scott territory in the winter of 1937-38. Spring opened reasonably early and seeding became general before the end of April.

During May, weather conditions were excellent for plant growth. In the middle of June, drought set in, and by the middle of July the crops were suffering severely. Crop yields were further reduced by grasshopper invasions. Rust affected crops at Rosetown, Guernsey and Juniata. At Consort, wheat stem saw-fly added further to the difficulties encountered.

In spite of these adverse conditions, fairly good crops were secured on the Sub-Stations, with the exceptions of Dunblane, Juniata and Loverna. At Metiskow, where the establishment of grass cover on drifting sandy land is the major project, good yields of annual fodder crops were secured and a 75-ton silo was filled for the first time in several years.

Soil drifting control - Strip farming is carried out on all Sub-Stations in the Scott area. Strips vary in width from five to thirty rods, according to soil type. In 1938, little drifting was observed on strips, but some drifting occurred on larger fields. Over a period of years, however, strip farming alone has not given complete control of drifting.

Suitable cultural practices, in addition to strip farming, are essential for soil drifting control. Over a four-year period, surface tilled summerfallows have controlled drifting on Sub-Stations to a greater extent than have ploughed fallows where the soil is of a sandy nature and where previous moisture conditions produced good trash cover. Ploughed fallows withstood drifting better than surface tilled fallows on heavy and medium land where no trash cover was present.

Cover crops - Results and observations of cover crop studies in this district have shown that where cover crops can be grown, they are not of great value in the control of soil drifting, and that the yields of crops following the cover crops are reduced. In many cases it has been impossible to grow cover crops due to drought or grasshopper attack.

Crop rotations - The study of suitable cropping systems is an important phase of Sub-Station work. Due to very dry seasons in recent years and to heavy weed infestation, the percentage of land under summer-fallow has been increasing. For this reason, the two-year rotation of fallow and crop is the most common sequence on Sub-Stations in the Scott P.F.R.A. area, although longer rotations are followed to advantage in favourable locations.

Forage crops - Forage crop studies on Sub-Stations are conducted with three objectives, namely,
(1) To provide feed for live stock.
(2) To control soil drifting.
(3) To determine the most suitable varieties.

Oat green feed, fall and spring rye, corn, sunflowers and millet have been grown for feed. Of these, oats has been the most satisfactory single crop grown.

Crested wheat grass has proven useful for regrassing, light drifting soil, although considerable difficulty has been experienced in securing stands on badly eroded areas.

Tests with three varieties of sweet clover, three varieties of alfalfa, three species of clover, and nine different grasses, have been conducted on plots.

Farm gardens - Vegetable gardens on all Sub-Stations gave results in 1938 considerably above the average. One contributing factor was the existence of good shelterbelts which promoted the accumulation of snow moisture on garden areas.

Field days - During 1938, field meetings were held at each of the Sub-Stations, with the exception of Rosetown, where it was necessary to cancel the meeting on account of heavy rain. The average attendance at these meetings was 271 persons.

Drought and soil drifting studies at Scott, Sask. - Studies of certain soil drifting and drought problems are conducted on Section 19, Township 39, Range 20, W. 3rd, adjacent to the Dominion Experimental Station at Scott. This section, commonly referred to in the district as "section 19", was rented under the Prairie Farm Rehabilitation Act for the two-fold purpose of studying experimentally, problems concerning drought and soil drifting, and of demonstrating to farmers, by the use of large fields, various farm practices recommended for use in west-central Saskatchewan.

Strip farming - In strip farming demonstrations conducted during 1938 on "section 19", no very large differences in crop yield could be attributed to different methods of seeding or cultivation, though seeding with the one-way disk seeder, followed by packing, produced larger yields than other methods used. The summerfallows in strip farming were considerably less inclined to drift than in large blocks, with eight rod strips apparently more effective in preventing drifting than sixteen rod strips.

Cultural practices - The effect of various cultural treatments in producing a desirable rough, lumpy surface was measured in part by sifting samples of the surface soil to determine the percentages by weight of the soil in different sized lumps. One interesting result of these tests was that the ploughed summerfallow was superior to ploughless fallow in producing a lumpy surface. Another result of the cultural experiments on Section 19 indicates that the "slaking" of surface soil to a silty powder following a short, heavy downpour of rain, may be overcome more effectively by cultivating with a hay rake than with an ordinary cultivator. Yields secured from eight different methods of preparing summerfallow land for seed, however, did not show much difference, except on land which received no cultivation but on which weeds were mown, where low yields were secured.

Snow conservation - Studies in snow conservation conducted during the winter of 1937-38 indicated that snow ploughing and the formation of drifts around snow fences were useful in retaining snow on fields for longer periods in the spring, and with greater penetration of snow moisture in the soil, than where these practices were not followed.

Hay crops - Oats grown for hay in 1938 produced more feed than did western rye grass, crested wheat grass, or brome grass.

Sub-Station Work in Southern Alberta

Thirteen District Experiment Sub-Stations in Southern Alberta are supervised from the Dominion Experimental Station, Lethbridge. These Sub-Stations are located at Acadia Valley, Bindloss, Castor, Cessford, Claresholm, Craigmyle, Drumheller, Foremost, Lomond, Nobleford, Pincher Creek, Rockyford and Whitla.

The Acadia Valley, Craigmyle and Nobleford Sub-Stations were established in the fall of 1938. At the Acadia Valley Sub-Station particular attention will be given to a farm-ranch organization suitable to the large surrounding territory. Craigmyle is situated in a grain growing area where soil drifting has been a problem in

recent years. At Nobleford, special study will be given to the control of wheat stem sawfly on a stripped farm, in co-operation with the Dominion Entomological Laboratory at Lethbridge.

Climatic and cropping conditions - Weather conditions generally during the past year have been much more favourable than for several years. In the spring, soil drifting threatened to become quite serious, but timely rains promoted the growth of crops sufficient to control much of the drifting. Sufficient feed was produced on all Sub-Stations to maintain stock for the winter, and in some cases, to provide a reserve supply. Hail did serious damage to 100 acres of oats at the Drumheller Sub-Station.

Soil drifting on Sub-Stations. - Very little soil drifting occurred during 1938 on Sub-Stations in southern Alberta. In the districts served by some Sub-Stations, however, severe drifting was experienced. In the Bindloss district medium to severe drifting occurred on several occasions, while on the Bindloss Sub-Station medium drifting on a 15-acre area occurred only twice, and was speedily brought under control. The value of the drift control measures such as strip farming and surface cultivation used on these Sub-Stations was very strikingly illustrated.

The successful use of strip farming on Sub-Stations to prevent soil drifting has led to widespread adoption of this practice by farmers in southern Alberta.

Surface cultivation with the duckfoot cultivator and the rod weeder but without ploughing, to maintain a trash cover on fallows, is rapidly becoming the standard cultural practice in districts where drifting may occur. On heavy stubble, the one-way disk is used. At Pincher Creek the Noble blade weeder has proved effective, especially where there are stands of wild rosebush.

Seed production - All operators of Sub-Stations were supplied with registered or certified seed in the spring of 1938, from which a considerable quantity of good seed has been produced. Farmers in the vicinity of Sub-Stations may secure supplies of this seed at a small premium over commercial grain.

Other activities - Tree planting, farm gardening and poultry production are important features of farmstead work on all Sub-Stations. Field days were held during July at all Sub-Stations, with an average attendance of 175.

RECLAMATION

Reclamation work under the Prairie Farm Rehabilitation Act has two main objectives, as follows:

1. To re-establish crop production on land which has been abandoned due to drought, soil drifting or unsuitable cultural practices. Projects in which this is the main objective are referred to as reclamation projects. Work of this nature is in the main of an investigational nature.

2. To re-establish grass cover on land which is demonstrably unfit for crop production by reason of inadequate precipitation or great susceptibility to drifting. Projects with this main objective are regrassing projects.

Reclamation projects - Experiments to determine the best methods of reclaiming severely drifted land for crop production or grazing have been established at 11 points throughout the drought area, as shown in the following statement.

Progress of Reclamation Work During 1938

During 1938, reclamation and regrassing work under the P.F.R.A. was in progress at more than 270 different locations in the drought area, involving over 123,000 acres of land. On a large proportion of this land soil drifting has been brought under control. The success secured in this work has stimulated the adoption of similar work among farmers, so that several times the above acreage has been indirectly benefited by this reclamation work.

The progress of reclamation work conducted during 1938 by the various Experimental Farms is presented below under the headings of:

Reclamation
Regrassing
Regrassing Community Pastures.

Reclamation Projects under the Prairie Farm Rehabilitation Act

1938

Reclamation Project	Areas in Project	Dominion Experimental Farm, Supervising Work
Melita, Man.	1280	Brandon, Man.
Craik, Sask.	180	Indian Head, Sask.
Aylesbury, Sask.	950	" " "
Kisbey, Sask.	721	" " "
Estevan-North Portal, Sask.	1182	" " "
Cadillac, Sask.	400	Swift Current, Sask.
Mortlach, Sask.	1280	" " "
Meyronne, Sask.	200	" " "
Youngstown, Alta.	290	Lethbridge, Alta.
Cereal, Alta.	150	" "
Hutton, Alta.	160	" "
Total acres	6793	

Emergency Reclamation - During the spring of 1938, soil drifting on 64,000 acres of farm land in southwestern Saskatchewan, and 26,000 acres in southern Alberta, was kept under control by emergency cultural operations until spring sown crops could become established. This was accomplished by cooperative action of the farmers concerned, with leadership, equipment and tractor fuel supplied, as required, by the Dominion Experimental Farms.

Reclamation Work in Southwestern Manitoba

Melita Reclamation Station - Reclamation work in Manitoba under the P.F.R.A. has been limited, for the most part, to experimental work conducted on the Reclamation Station at Melita. This Station comprises 1280 acres of land which had been abandoned prior to 1935 because of excessive soil drifting. Since 1935, this land has been largely reclaimed for crop production.

Crop yields - During the past season, fair crop yields were secured on the Melita Station, Durum wheat yielding as high as 21 bushels and Renown wheat 16 bushels per acre, while fall wheat yielded up to 24 bushels per acre. The yields of oats and barley, however, were somewhat low. Grain crops, particularly those maturing late, suffered from rust and grasshoppers. Very good yields of sweet clover were secured.

Strip farming - Strip farming has proved an effective method of reclaiming land at Melita, both where drifting was severe and also where the land is overrun with weeds such as couch grass. While not in itself a complete preventive for drifting, strip farming has restricted drifting to smaller areas than where large fields are used. On weedy land, strip farming has provided a method of eradication, without rendering the land unduly susceptible to drifting.

During 1938, higher yields and less drifting was secured at Melita on strips than on large fields. The best yields of wheat were secured on strips 16 rods wide as compared with narrower strips. The chief disadvantage of strip farming at Melita arises from insect attack, strips providing a greater marginal area for this attack than do large fields.

Rotations - A large number of rotations, ranging in duration from two to six years, is under trial at Melita. These rotations have not been in operation for a sufficiently long period to enable reliable comparisons. From results secured during 1938, however, it would seem that, at Melita, sweet clover exerts a beneficial influence on the yield of the succeeding crop in the rotation.

Forage crops - Experiments to determine the best forage crops for the district are in progress at Melita. In these tests, millet grown for hay, survived grasshopper attack better than any other forage crop grown on the Station.

Cereal crops - Trials with various varieties of cereals, including spring wheat, Durum wheat and barley, are in progress with a view to ascertaining the best varieties, as well as the best dates and rates of seeding.

Reclamation Work in Southeastern Saskatchewan

Four major reclamation projects are located in this district, at Craik, Aylesbury, Kisbey and in the Estevan-North Portal area.

Craik - This project was started in the fall of 1937, approximately 180 acres of drifting soil being seeded to fall rye. During 1938 this rye made good growth, and effected an almost complete control of drifting in the area. On 80 acres of this land, which had been recently valueless for crop production, rye at the rate of 14.4 bushels per acre was harvested. Some of this grain is being distributed among farmers in the vicinity for further control work.

Aylesbury - On this project, which was started in 1936, complete control of soil drifting was effected in 1937 on some 950 acres by seeding fall rye. During 1938 the rye stubble, together with a volunteer growth of rye, continued to check drifting. Due to grasshoppers and adverse weather, however, grass sown on this land made little growth.

Kisbey - During the early fall of 1938, work was undertaken to reclaim 605 acres of land near Kisbey, partly by seeding fall rye and barley, and partly by listing. In addition, 116 acres of land in an older reclamation project in this area was reseeded to fall rye and barley. By the end of September, sufficient growth had been made to effect good control of drifting.

Estevan - North Portal - In the area southeast of Estevan, reclamation work was started in the fall of 1937 on a number of focal points of drifting, amounting in the aggregate to about 4000 acres. On some of these areas, 8-rod strips were sown to fall rye in alternation with 4-rod strips which were listed. The purpose of the listing is to provide temporary control of drifting until the rye might make sufficient growth to hold the soil. In the late fall of 1938, 882 acres of land in this area were seeded to fall rye, and 300 acres were listed in strips, as described above.

On all of the reclamation projects in southeastern Saskatchewan, the ultimate object is to establish grass cover on areas where severe drifting has been a menace to neighbouring better-class land. Considerable success has already been achieved in securing some cover of stubble or weeds on these areas, preliminary to seeding down to suitable grasses.

Reclamation Work in Southwestern Saskatchewan

Experiments to determine the best methods of reclaiming severely drifted land have been in progress at Cadillac and Mortlach since 1936, and at Meyronne (Woodrow) since 1937. Favourable climatic conditions during 1938 facilitated the work of reclamation on these Stations.

Cadillac

Of 400 acres of badly drifted land on this Station, some 300 acres had been reclaimed by 1937. On the remaining 100 acres, which had hitherto resisted control measures, a fair stand of spring rye was established in 1938. This rye was not harvested but left to volunteer in 1939, with the object of improving the cover prior to regrassing.

Mortlach

Experiments at Mortlach include strip farming, grass production and reclamation methods. On very light sandy land at Mortlach it has been found that strip farming would not control drifting, the only satisfactory method being to seed the entire drifting area to rye, when favourable moisture conditions prevail, with the object of establishing a permanent grass cover. On slightly heavier soil, drifting was checked by strips of not more than eight rods in width. Practically all drifting land on this Station was brought under control during the past favourable season.

Meyronne

Fall rye sown in 1937 on 200 acres of drifted land at this Station was destroyed by further drifting, and the drifting area increased to 250 acres. Reseeding after listing under favourable moisture conditions in 1938 resulted in a good cover of spring rye, and complete control of drifting. Crested wheat grass was sown in 100 acres of rye stubble.

Results of Reclamation Experiments in Southwestern Saskatchewan

From the results of experimental work conducted over a period of three years on the Reclamation Stations in southwestern Saskatchewan, the following technique for the reclamation of severely drifted land has been developed;

1. Listing when the soil is moist, constitutes the most effective cultural practice to stop drifting on bare land.

2. Seeding spring or fall rye according to season on listed land is an effective method of establishing vegetative cover on bare land. Such seeding should only be done when both moisture and temperature conditions will promote rapid germination. Furthermore, the seed should be sown broadcast, rather than in the furrow bottoms, since growth on top and sides of listed ridges has shown a marked effect in checking soil drifting.

3. Shallow drilling of grass, particularly crested wheat grass in standing rye or weeds is useful method of establishing permanent cover on drifted land. Best results have been secured from late fall or early spring seedings, which enable the germinating grass to take full advantage of favourable moisture conditions.

Reclamation in Southern Alberta

Reclamation projects under the P.F.R.A. have been established at Hutton, Youngstown and Cereal in southern Alberta.

Hutton Reclamation Project - This project is located on 160 acres of sandy loam on which drifting had occurred continuously for four years. In the fall of 1935 this area was seeded to fall rye, drilled without previous cultivation. Most of the fall rye winter-killed and the area was reseeded to spring rye in 1936, an excellent stand being secured. Crested wheat grass was drilled in the stubble of the rye crop in the fall of 1936. Little growth of crested wheat grass was secured during the dry season of 1937, but favourable weather in 1938 resulted in a satisfactory stand without further seeding. This area is now completely covered with crested wheat grass, and further drifting is unlikely.

Youngstown Reclamation Project - The history of this project, covering 290 acres of blown-out land, is similar to that of the Hutton project. Crested wheat grass, sown in the fall of 1936 in spring rye stubble, has gradually become established over the entire area, replacing a heavy covering of Russian thistles.

Cereal Reclamation Project - Work on 150 acres of blown-out abandoned land in this project was started late in the season of 1938. After some preliminary listing, this area was seeded on July 1st to a mixture of barley and fall rye, the seed drill being equipped with duckfoot cultivator teeth to produce a lumpy condition of the surface soil. Due to an unusually long season, the barley matured and was harvested. This area was completely protected against further drifting with barley stubble and fall rye and regrassing work is planned for the future.

Emergency soil drifting control, 1938 - Very severe conditions of soil drifting arose in southern Alberta during the dry season of 1937, the winter of 1937-38, and the early spring of 1938. So serious were conditions that the Dominion Experimental Station at Lethbridge initiated emergency control measures in cooperation with Agricultural Improvement Associations and individual farmers. These operations covered approximately 26,000 acres on which drifting was checked, and benefited a much larger adjacent acreage. The success of this work was so positive that it greatly increased the confidence of farmers in their ability to control serious drifting situations.

REGRASSING DEMONSTRATIONS

Experiments to determine the best methods of seeding grasses and legumes on weedy or overgrazed land have been started at 246 locations. These projects vary in size from about 10 to 640 acres with an average of about 18 acres each. The total area covered is about 4500 acres. In a large percentage of these projects, satisfactory stands of grass have been established.

Regrassing Work in Southwestern Saskatchewan

Experiments on methods of seeding down land to grasses or clovers were started in 1935. By the fall of 1938 a total of 182 projects, ranging in area from 5 to 25 acres, and having an average area of 15 acres, were established in southwestern Saskatchewan. Satisfactory stands of grass have been secured on 71 per cent of the seeded acreage. In addition, seedings of alfalfa and sweet clover in grass mixture were made on 17 acres of low wet land in order to improve the quality of the vegetation.

From the results secured from these experiments over a period of four years, the following conclusions have been drawn:

1. Crested wheat grass is especially suitable for dry land regrassing.

2. Best results with grasses are secured when they are sown in late fall or early spring.

3. The chief causes of failure in securing stands of grass are: extreme drought, seeding too deep, seeding too late in the spring, and soil drifting.

Regrassing Work in West Central Saskatchewan and Central Alberta

Regrassing demonstrations are being conducted at approximately 60 points in the P.F.R.A. area supervised from Scott. The experimental object of this work is to determine the best methods of regrassing abandoned, weedy land as well as the utility regrassing for grazing purposes and soil drifting control. These projects, covering a few acres in each instance, are grouped in series according to objectives and procedure. Brief descriptions of each regrassing series are presented below.

Ribstone Date of Seeding Series - This series comprises eight demonstrations in the Ribstone or Wainwright district of east-central Alberta in which the object is to determine the best time to seed crested wheat grass on sandy land. In each demonstration crested wheat grass was drilled into weedy land in mid-September 1936, at the end of October, 1936, and again in mid-April, 1937. Brome grass was sown in mid-September, 1936.

Poor germination of these seedings was secured in the very dry season of 1937, but under more favourable climatic conditions in 1938, considerable growth took place without further seeding. By September of 1938, it was found that stands of crested wheat grass had been secured from the mid-September seeding in all eight demonstrations, from the late October seeding in only three demonstrations, and from the mid-April seeding in seven demonstrations. The stands of brome grass were considerably poorer than the corresponding stands of crested wheat grass.

From the foregoing results it would seem that the seeds of crested wheat grass when sown in very dry soil will retain its vitality for over a year until more favourable moisture conditions promote germination. Under the conditions of the Ribstone demonstrations, the best date to seed crested wheat grass was in September.

General "Method of Seeding" series - Demonstrations in which drilling crested wheat grass in weedy land was compared with broadcasting, both with and without previous disking, were started in the late fall of 1936 at 10 widely distributed points in Saskatchewan, and one point in Alberta. Only one date of seeding, late fall, was used.

Reasonably good germination was secured in the spring of 1937 from the seed which was drilled in, but broadcasting proved ineffective. In 1938, the superiority of drilling was still evident.

In seven additional demonstrations on light, sandy soil near Kerrobert, Sask., crested wheat grass sown in the late fall of 1936, made fairly good growth during the very dry season of 1937 where the seed was drilled, but poor growth where the seed was broadcast.

Low rates of seeding - At three points in Saskatchewan, where crested wheat grass was broadcast on abandoned, weedy land at rates of from one-quarter to three-quarters of a pound per acre, practically no germination was secured.

Width of drill in seeding grass - In the late fall of 1937, crested wheat grass seed was sown in both six and twelve-inch drills on stubble or weedy land, at 24 different points in Saskatchewan and at 6 points in Alberta. This work was done in cooperation with local Agricultural Improvement Associations. Good stands of grass were secured in the majority of these experiments, but it will take at least one more year for definite differences between the six and twelve-inch drills to become fully established.

In the fall of 1938, preparations were made to conduct the foregoing experiment on old pasture land at 42 different points. The areas selected for this work were mainly under native sod, where prairie sage, a good indication of overgrazing, had become dominant. The results of these experiments will not be known, of course, for some time.

The foregoing outline of P.F.R.A. regrassing work carried on by the Dominion Experimental Station at Scott, Sask., will indicate some of the methods followed, and a few of the results so far secured. As much of the territory in which this work is done is more suitable for grazing than for grain production, the establishment and maintenance of good grass cover is of paramount importance. The experiments described above should prove of great value in determining and demonstrating the best methods of securing desirable grazing conditions.

Regrassing Experiments in the Special Areas of Alberta

Regrassing experiments in southern Alberta are conducted in that part of the province which constitutes the Special Areas. There are about 8,700,000 acres of land in the Special Areas, mostly in the southeastern part of the Province. A considerable portion of this land was settled by farmers in the period 1909 to 1916, approximately 60 per cent of the area being brought under cultivation. Climatic conditions, however, proved adverse to crop production, by reason of very low precipitation. As a result, most of the cultivated land was subsequently abandoned, less than 10 per cent of the area being at present under cultivation.

In 1934, the Government of Alberta placed this area under the administration of a Special Areas Board, with the object of utilizing the marginal and submarginal land for grazing. To date, about 80 per cent of land in the Special Areas has been withdrawn permanently from farming, and is being used for ranching under long-term grazing leases.

In view of the fact that much of the formerly cultivated land in the Special Areas is covered with weeds, while many unbroken grass areas have been seriously overgrazed, the Special Areas Board has instituted a program of range improvement. To assist in this program, the Dominion Experimental Station at Lethbridge has been conducting regrassing experiments since 1935, under the P.F.R.A., at five selected points. The object of these experiments is to determine the best methods of re-establishing grass cover on abandoned or overgrazed areas. These experiments, which include tests of rates, dates, and methods of seeding grasses, are located at Bowell (640 acres), Cessford (222 acres), Stanmore (360 acres), Naco (300 acres), Sullivan Lake (120 acres). The total acreage under these experiments is 1642 acres.

Briefly, the results of four years work with regrassing experiments in the Special Areas of Alberta, lead to the following conclusions:

(1) Crested wheat grass has proved to be the most drought-resistant grass used in these experiments.

(2) The best method of seeding grasses is shallow drilling in stubble or weeds, which is better than drilling on summerfallow. Where grass seed is broadcast, it is better to cultivate the land after seeding.

(3) The best time to seed grass is late fall, although fairly good results have been secured with early fall seedings. Late spring and summer seedings have been entirely unsatisfactory in dry seasons.

(4) Seeding grasses at from four to seven pounds per acre in 12-inch drills seems satisfactory for large scale reseeding. Stands may be secured more quickly, however, where 10 to 12 pounds per acre are sown in 6 inch drills.

Information secured from these experiments in Southern Alberta is proving useful in large regrassing projects conducted by the Special Areas Board.

REGRASSING ON COMMUNITY PASTURES

In connection with the establishment of Community Pastures on submarginal areas by the Land Utilization Branch of the Prairie Farm Rehabilitation Administration in Regina, a considerable acreage of weedy or overgrazed land has been seeded down to grasses by the Dominion Experimental Farms at Indian Head, Sask., Swift Current, Sask., and Scott, Sask. Details of this work are presented below.

Regrassing Community Pastures

Acreage regrassed to end of 1938

Pasture	Headquarters of pasture	Acres regrassed	Dominion Experimental Farm conducting seeding operations
Excel	Ormiston, Sask.	2380	Indian Head, Sask.
Usborne	Venn, "	1348	" " "
Dundurn	Dundurn, "	878	" " "
Laurier	Radville, "	2376	" " "
Webb	Swift Current, Sask.	1895	Swift Current, "
Mariposa	Kerrobert, "	8043	Scott, Sask.
Kindersley-Elva	Kindersley, "	4835	" "
Battle River-Cutknife	N. Battleford, "	435	" "
	Total acres	22,190	

Seed purchased for regrassing community pastures in the fiscal year 1938-39 included 289,425 pounds of crested wheat grass, 45,000 pounds of brome grass, 3500 pounds of sweet clover, and 1000 bushels of fall rye. The fall rye is used to protect drifting areas until grass can become established. This seed supplied by the Land Utilization Branch at Regina.

In connection with the foregoing regrassing work, a considerable amount of experimental work on methods of seeding grasses is in progress. As this program of regrassing is conducted on a much

larger scale than has been previously attempted on range land in the Prairie Provinces, the results will be of great value for future work.

GRAZING SURVEYS

In connection with the P.F.R.A. program of utilizing sub-marginal lands for grazing purposes, pasture surveys have been conducted by the Dominion Experimental Station, Swift Current, at a number of points throughout the drought area. The object of these surveys is to estimate the carrying capacity of different areas, having regard to the type of livestock carried, the distribution, palatability and nutritive value of the herbage, the quality and distribution of water supplies, and numerous other economic factors.

Grazing surveys of this type were started in 1937 when 51,840 acres at Val Marie, Sask., and approximately 530,000 acres in the Special Areas of Alberta, were covered.

During 1938, grazing surveys were made of 16 community pastures established under the P.F.R.A. in Saskatchewan, the total area covered being 202,760 acres. In addition, surveys were made of 202,260 acres of rangeland in the vicinity of Val Marie, and of 404,600 acres in the Great Sandhills area northwest of Swift Current.

The total area covered by pasture surveys in 1938 was 809,620 acres, while the total for both 1937 and 1938 is 1,391,460 acres.

SOIL MOISTURE CONSERVATION

Under this heading are considered such methods of increasing soil moisture as flood irrigation by dykes, terracing, contour furrowing and basin listing.

Basin Listing Southwestern Manitoba - Preliminary trials were made in the fall of 1937 with a three-furrow basin ~~lister~~ at various points in southwestern Manitoba. In the following spring, soil moisture determinations were made on both basin-listed and unlisted land at three points, Goodlands, Boissevain and Waskada - while yield comparisons were secured at Boissevain. No conclusive differences of soil moisture due to treatment were observed, either on level or sloping land. At Boissevain, the yield per acre of wheat on fall basin listing was 12.6 bushels as compared with 17.2 bushels of spring ploughing, 18.3 bushels on fall ploughing and 20 bushels on summer-fallow. In this connection it should be observed that there was one very little run-off in the spring of 1938, so that any possible effect of basin listing in preventing run-off did not materialize.

Further trials with the basin lister were started in the fall of 1938 on the farms of 25 members of Associations in southwestern Manitoba. It is hoped that these trials will result in more definite information on the value of basin listing.

Soil Moisture Conservation in Southwestern Saskatchewan

Neidpath Dyking Project - With the object of utilizing spring run-off water for the flood irrigation of pasture lands, a dyking project was started in 1937 at Neidpath in cooperation with the Rural Municipality of Coulee. This project, consisting of a system of diversion dams, dykes, and ditches, spreads run-off water from coulees on to 30 acres of pasture land. During 1938 adjustments and repairs were made to the dyking system, in order to provide for exact comparisons between dyked and undyked land.

Part of the work at Neidpath consists of comparing alfalfa, sweet clover, brome grass and crested wheat grass, sown on both broken and unbroken native sod under flood irrigation. On the unbroken sod

good stands of sweet clover and brome grass have been secured, but results with alfalfa and crested wheat grass have been disappointing. Where the native sod was not broken, little or no growth of any of these crops has been secured. These results indicate that on land which can be flood irrigated, breaking the native sod and seeding sweet clover or brome grass may be a useful method of range improvement.

Other dyking projects - Dyking projects somewhat similar to that at Neidpath, have been constructed at various points, including the Dominion Experimental Station at Swift Current, the Dominion Range Experiment Station at Manyberries, Alta., and at the District Experiment Sub-Station, Canuck, Sask.

Terracing - Experiments to determine the value of terracing for water erosion control and soil moisture conservation have been started at Swift Current and Canuck.

Contour furrowing - The practice of ploughing furrows along contours to increase moisture penetration in the soil by checking the rate of run-off on sloping pasture land, is undergoing thorough tests on the Dominion Experiment Range Station at Manyberries, Alberta. This work is supervised from the Dominion Experimental Station at Swift Current.

Basin listing - In the fall of 1937, selected fields on the Experimental Station and on nine District Experiment Sub-Stations were basin listed, in comparison with adjacent unlisted areas. In the spring of 1938 the soil moisture content of both listed and unlisted areas was determined.

The results of these tests have proved somewhat inconclusive. The average amount of soil moisture in the listed areas in the spring was 14.55 per cent as compared with 14.39 per cent on unlisted areas, a difference of only 0.16 per cent in favour of basin listing. Moreover, in five locations out of eleven, the moisture content of the unlisted land was slightly in excess of the listed land. Crop yields confirmed these findings. Further trials will be necessary, however, before the value of basin listing for moisture conservation can be determined under various conditions of soil type and topography.

Soil Moisture Conservation in Southern Alberta

The dry land water conservation investigations conducted in 1938 by the Lethbridge Station consisted of methods of preventing the loss of water from fields by spring thaws and torrential storms.

Contour dykes and ditches - Contour dykes and ditches were laid out in nine farms. The total length of dyke and ditch amounted to 35,200 feet. The value of this work for moisture conservation will be determined in 1939 and subsequent years.

Contour farming - Contour farming, in which all cultural and seeding operations are conducted along the contours of the land, was undertaken on steep land at Morrin. The present indications are that the power requirements for the cultivation of this land, as well as the danger of water erosion, will be greatly reduced by this type of farming.

Basin listing - A number of farmers in Southern Alberta, basin listed parts of their summerfallow fields in the fall of 1937. Wherever satisfactory comparisons between listed and unlisted fields were available, determinations were made in the spring of 1938 of the depth of soil moisture penetration. Subsequently, comparable crop yields were secured. Altogether, data were secured at 16 points, but on three of these the crops were destroyed by hail.

On the average it was found in 14 comparisons that moisture had penetrated 3.8 feet into basin listed soil, 3.0 feet into unlisted soil, a difference in favour of basin listing of 0.8 feet. On the 14 areas where crop yields were secured, the average yield per acre of wheat 21.1 bushels on basin listed land and 20.0 bushels on unlisted land, a difference of 1.1 bushels in favour of basin listing. Variations in the results secured on different fields reduce the significance of these averages, and further investigations will be necessary to determine accurately the effects of basin listing in southern Alberta.

Contour furrowing on pasture lands - Ploughing furrows along contours to prevent rapid run-off of melting snow and heavy rainfall on sloping pasture lands is being tried out in six localities.

AGRICULTURAL DEVELOPMENT OF LARGE IRRIGATION PROJECTS

Under the Water Development Branch of the Prairie Farm Rehabilitation Administration a number of large community irrigation projects have been constructed or are being constructed in various parts of the drought area.

Irrigation Development in Southwestern Saskatchewan

In southwestern Saskatchewan, the Dominion Experimental Station, Swift Current, has undertaken the agricultural development of four of these irrigation projects, located severally at Val Marie, West Val Marie, and Eastend on the Frenchman River, and at Downie Lake on the Maple Creek. These projects form units in an extensive water development system for utilizing the run-off from the Cypress Hills of which a large storage reservoir in Cypress lake is a component part. Description of the work on each of these projects are given below.

Val Marie Irrigation Project - This project provides for the irrigation of 6000 acres of river-bottom flats near the village of Val Marie by means of a 3600 foot dam across the Frenchman River, constructed in 1936, which stores some 6000 acre-feet of water. Agricultural development of this project was started in 1937, this work including the clearing and levelling of land, the siting and excavation of irrigation ditches, and the seeding, irrigation and harvesting of crops.

During 1938, crops were grown on 3625 acres of irrigated land at Val Marie. The total crop produced on the area included 700 bushels of wheat, 126,602 bushels of oats, 2350 tons of baled straw, 10 tons of alfalfa, 50 tons of grass hay and a quantity of oat sheaves. At current market prices, the value of the foregoing crops amounted to $69,385.90 or $19.14 per acre. Inasmuch as some 1800 acres of this land was formerly valueless for crop production, while the remainder was relatively unproductive in recent dry years, and in view of the very low prices received in 1938 for farm produce, the ultimate success of this project seems well assured.

Additional activities at Val Marie during 1938 included the excavation of 5.5 miles of main drainage ditch; the construction of 7 miles of roads and a number of bridges and culverts. Some 35 miles of fence was built, sufficient to enclose the irrigable land. Spreader dykes were constructed at a number of points on the steep sides of the river valley to prevent washouts of roads, canals, and ditches on the project. Some progress was also made in preparing new land for irrigation, some 847 acres being cleared of brush of which 754 acres were ploughed, and 694 acres prepared for irrigation. This work will continue until the entire 6000 acres of land in the Val Marie project is under irrigation.

Eventually, it is proposed that the irrigable land at Val Marie shall be sold in small blocks for the production of reserve forage crops to supply reserves of feed for ranchers and farmers on adjacent dry land. To this end the irrigable land has been tentatively divided into 40 acre allotments.

In connection with the agricultural work at Val Marie a considerable number of cropping and cultural experiments have been laid down. This work includes experiments to determine the value of fertilizers on irrigated land, the best methods of preparing land for irrigated crops, and the best methods of establishing permanent stands of grasses and legumes, particularly alfalfa. An important problem at Val Marie is to prevent the formation of a crust on the heavy land after each irrigation. It was found that crusting could be prevented by spreading manure on the land. The possibility of using straw for this purpose will be explored.

West Val Marie Irrigation Project - This project, located just above the Val Marie project on the Frenchman River, provides for the irrigation of 4146 acres of land. As the construction of works for this project is still in progress, actual irrigation will not be done until 1940. In the meantime, the preparation of land for irrigation is being carried on by the Dominion Experimental Station at Swift Current. During 1938, some 1481 acres were ploughed and additional work will be done during 1939, in order to have as much irrigable land as possible under water in 1940.

Eastend Irrigation Project - Located on the Frenchman River near Eastend, this project provides for the irrigation of 3200 acres of river flats. As the storage capacity of the Eastend dam is some 1300 acre-feet, sufficient water for the entire project will not be available until the completion of the Cypress Lake reservoir, of 70,000 acre-feet capacity, at the head of the Frenchman River. During 1938, oats were grown under irrigation on 250 acres of land controlled by the Experimental Station, and on 160 acres of farmers' land. Eventually this project will be sub-divided for forage production by farmers on adjacent dry land.

Downie Lake Irrigation Project - This project is designed to irrigate 5868 acres of land along Maple Creek near the town of that name. During 1938 the Experimental Station cleared 1350 acres of irrigable land as part of the agricultural development program for this project.

Small Irrigation Projects

Follow-up Program with Small Projects - Since the inauguration of the P.F.R.A. program in 1935, a large number of small irrigation projects have been constructed by the Water Development Branch for private farmers. In 1937 the Dominion Experimental Station at Swift Current initiated a follow-up program for small irrigation projects, consisting largely of providing expert assistance to farmers in irrigation practices, and to advise as to cropping and cultural practices. During 1938, this type of personal assistance was extended to operators of 102 small irrigation projects, ranging in area from one-half to 900 acres, and aggregating 10,000 acres of irrigable land. Work of this nature is especially beneficial in enabling farmers, without previous irrigation experience to secure the maximum benefit from small irrigation projects.

Some development of irrigation has taken place on the Dominion Experimental Station at Swift Current. This work includes the irrigation by pumping from the Swift Current Creek of 14.1 acres of cereal and forage plots, as well as gravity irrigation from a small dam of 4.4 acres of alfalfa and 5.4 acres of ornamental grounds.

Flood irrigation by dyking systems is described below under "Soil Moisture Conservation".

Irrigation Development in Southern Alberta

Early in the spring of 1938 offers of practical assistance in irrigation were made to all operators of small P.F.R.A. irrigation projects in southern Alberta. An experienced man from the Lethbridge Station visited each applicant and demonstrated suitable methods of locating and constructing irrigation ditches, levelling land, and applying water. Altogether, 32 farmers were given this type of assistance. In addition, an automatic land leveller was loaned to farmers who required its use.

AGRICULTURAL IMPROVEMENT ASSOCIATIONS

For the purpose of informing farmers of the aims and objects of the Prairie Farm Rehabilitation Program, and of encouraging co-operative community action on drought and soil drifting problems, Agricultural Improvement Associations have been organized among farmers at a number of points throughout the drought area. The essential characteristic of these Associations is that members agree to adopt as uniformly as practicable such measures for drought and soil drifting control as seem suitable under local conditions. In this manner the effectiveness of these control measures is greatly increased as compared with the uncoordinated efforts of individual farmers. For this reason special assistance is offered members of Associations to enable them to adopt certain rehabilitation measures on their farms.

Assistance for Agricultural Improvement Associations

The following assistance for Agricultural Improvement Associations is provided by the federal government.

1. Advice and assistance in organization by Superintendents of Dominion Experimental Farms, and by Supervisors appointed for Association work.

2. Actual practical farm to farm advice and assistance to members of the Associations in adopting rehabilitation measures, such as strip farming, suitable cultural practices, methods of establishing grass cover, water development, tree planting, farm gardens and other measures suitable to local conditions.

3. Free supplies of forage crop seeds for the establishment of seed plots. The object of this phase of the work is to enable farmers to produce their own supplies of seed for pastures and for controlling drifting on sub-marginal land. Seed of grasses, legumes or corn, according to local conditions, is supplied through Associations to members in quantities sufficient to establish a small plot, usually from 2 to 5 acres.

4. Trees for home shelterbelts are supplied free to members to a maximum of 10,000 trees or cuttings per farm, the number supplied also depending on the condition of existing shelters, and the condition of land for planting. Free transportation is supplied for the nearest station. This form of assistance is extended to all farmers within the P.F.R.A. area.

5. Water Development. Applications for assistance in water development are relayed to the Water Development Committee.

6. Financial Assistance. Subject to certain conditions, grants are made to Associations for operating expenses to the extent of

$50.00 per association comprising up to 100 members, plus 50 cents per member in excess of 100, to a maximum of $100.00 per association.

7. Beginning in 1939, small lots of seed eyes of certified seed potatoes are being provided for members of Associations.

Progress with Associations

From the inauguration of the rehabilitation program in 1935 to the end of March 1939, a total of 170 associations had been formed with a total membership of over 25,000. This membership represents approximately 14.6 per cent of the farmers within the P.F.R.A. area. Approximately 40 per cent of the P.F.R.A. area is served by Associations.

The following data regarding Agricultural Improvement Associations may be of interest.

Agricultural Improvement Association

March 31, 1939

District	Number of associations		Number of members	
	No.	Increase	No.	Increase
Southwestern Manitoba	19	7	3654	1604
Southeastern Saskatchewan	25	8	3532	1213
Southwestern Saskatchewan	47	14	6012	1888
West Central Saskatchewan and Central Alberta	50	23	8559	4960
Southern Alberta	29	9	3248	1325
	170	61	25,005	10,990

The name, headquarters, and membership of each Association is presented in Appendix 2.

Agricultural Improvement Associations in Southwestern Manitoba

Nineteen Agricultural Improvement Associations have been organized under the P.F.R.A. in southwestern Manitoba with a total of 3654 members. Since March 31, 1938, new Associations have been formed at seven points, while the membership has been increased by 1604.

Forage Crops - The distribution of seed of grasses, legumes, corn, and millet for the establishment of seed plots is a major Association activity in southwestern Manitoba. A general lack of plant fibre in the soil is a principal cause of soil drifting in this district, and efforts are being made to improve this condition by increasing the acreage under forage crops. To this end, sufficient seed to establish seed plots of two or three acres each was supplied during 1938 to 1990 members of Associations, over 59,000 pounds of seed being used for this purpose.

During the past year, a total of 2889 forage plots, which had been sown by members of Associations in southwestern Manitoba, were inspected by the staff of the Dominion Experimental Farm, Brandon. It was found that 43 per cent of these plots were in good condition, 31 per cent medium, 17 per cent poor and 9 per cent were failures.

Corn for seed, forage, and soil drifting control is being given considerable prominence through Associations in southwestern Manitoba. The practice of growing corn in widely spaced rows on summerfallow has been found to retard wind erosion without unduly depleting soil

moisture. During 1938, P.F.R.A. corn shellers were used to shell 2700 bushels of corn for 56 farmers in the district. Some of this corn was grown from home-grown seed.

Live stock work - A number of purebred sows and boars from spring litters were distributed in June to members of seven Associations. Of the 38 pigs distributed, 26 later qualified for registration, and will be used for breeding improvement purposes.

Meetings - Five field days and 24 other meetings were held during 1938 by Associations in Manitoba.

Agricultural Improvement Associations in Southeastern Saskatchewan

Twenty-five Agricultural Improvement Associations have been organized in the Indian Head territory, with a total membership of 3532. During the past year the number of Associations has increased by 8, and membership by 1213.

Forage Seed Distribution - The establishment of seed plots of forage crops by farmers is a major activity of Associations in this district. In April, 1938, grass seed, clover and corn was distributed to members of fourteen Associations in the following quantities:

Crested wheat grass	9920 lb.
Sweet clover	6260 lb.
Alfalfa	1800 lb.
Brome grass	3960 lb.
Corn	5448 lb.
Total seed	27388 lb.

Crested wheat grass gave the best results in 1938 and a larger percentage of stands of this grass was secured than from any other seed distributed. In the southeast, around Estevan and Alameda, however, many good catches of crested wheat grass were completely destroyed by grasshoppers. Corn gave very satisfactory results and some excellent stands of this crop were secured. Some very good stands of sweet clover and alfalfa were secured. Brome grass gave very poor results in 1938.

Personal Service - Personal calls were made during 1938 on 200 members of Associations. Inspection was made of all grass seed plots. In these visits, various phases of the rehabilitation program were discussed with the object of securing cooperative action, particularly as regards soil drifting control.

Meetings - Sixteen general meetings were held by various Associations during the year. Discussion at these meetings centred mainly around soil drifting control, rust resistant wheat, control of insect pests and water development work.

A short course was held in February at the Dominion Experimental Farm, Brandon, for delegates from Agricultural Improvement Associations and operators of Sub-Stations. Delegates from 12 Associations were present. The course lasted for three days and included lectures and discussions.

Agricultural Improvement Associations in Southwestern Saskatchewan

In the district supervised from Swift Current there are 47 Agricultural Improvement Associations with a total membership of 6012, representing an increase of 14 Associations and 1888 members since April 1st, 1938.

Associations in this district have been organized to deal with problems of crop production, ranching, or both combined. Various Community projects carried on during 1938 by Associations under the guidance of the Dominion Experimental Station at Swift Current are outlined below.

Emergency soil drifting control - During the spring of 1938, soil drifting menaced extensive areas of southwestern Saskatchewan. To cope with this problem, emergency soil drifting control measures, consisting mostly of large scale listing, were undertaken by the Pambran, Pennant, Shaunavon and Tompkins Associations, a total of 55,000 acres being brought under control. In addition, soil drifting was checked by similar measures on 8000 acres in smaller projects. This cooperative attack on the soil drifting problem represents one of the more useful functions of these Associations.

Soil moisture conservation - Experimental work on terracing, contour furrowing, basin listing, and with snow fences have been conducted by various Associations. As part of this program some 40 acres have been terraced near Swift Current and 100 acres at Verlo. Snow fences, to promote the formation of drifts on selected areas have been tried out by the Leinan Association. Basin listing experiments have been undertaken by the Instow and Shaunavon Associations. These projects will provide useful supplementary data to extensive soil moisture experiments being conducted by the Dominion Experimental Station at Swift Current.

Sawfly control - For the control of sawflies, a total of approximately 100 miles of buffer strips of brome grass were sown in the fall of 1938 by Associations at Carmichael, Herbert, Lafleche, Pennant, Shaunavon, Swift Current and Woodrow.

Meetings - During 1938 there were held 119 meetings of Associations with an average attendance of 55 members. From February 22 to 25 inclusive, a convention of Agricultural Improvement Association executives was held on the Dominion Experimental Station at Swift Current.

Agricultural Improvement Associations in West Central Saskatchewan and Central Alberta

In the P.F.R.A. territory supervised from the Dominion Experimental Station at Scott, a total of 50 Agricultural Improvement Associations has been organized, 37 in west-central Saskatchewan, and 13 in Central Alberta. The total membership of these Associations is 8559. Since 1938, there has been an increase in this territory of 23 Associations and 4960 members. The more important activities of these Associations during 1938 are outlined below.

Forage Seed Plots - A general improvement in climatic conditions in 1938 favoured the growing of forage seed plots, which remains the major activity of members of all Associations. Forage seed distribution to Associations in 1938 totalled 31,175 pounds, crested wheat grass accounting for 18,660 pounds. Alfalfa has become the most popular legume. Great variations occurred in the results secured in forage seedings, but a marked improvement was shown over the previous year.

Water Development - Interest in small water development projects has been greatly stimulated by the formation of Agricultural Improvement Associations. During 1938 a total of 467 members in this region applied to the Water Development Committee for assistance in constructing small projects.

Tree Planting - While tree planting has not proved as popular as forage seed production or water development in this district, considerable interest has been shown in the P.F.R.A. program of establishing farm home shelterbelts, as well as an improved farm garden and fruit trees.

Special activities of Associations - Aside from forage seed production, water development, and tree planting, for which assistance is provided from P.F.R.A. sources, Association activities in the Scott territory have made very considerable progress, especially in matters affecting live stock.

Neutral Hills Live Stock Board in Alberta - The largest special project connected with Association work in Alberta is the Neutral Hills Live Stock Board. This Board is an organization of Agricultural Improvement Associations which was formed in 1937 by the Neutral Hills Association, in cooperation with the Sounding Creek and Black Hills, all in Central Alberta. The original object of this Board was to improve the marketing of live stock, mutually beneficial contacts being established between prospective sellers and buyers.

The Neutral Hills Live Stock Board now comprises representatives from all 13 Associations in Alberta under supervision of the Dominion Experimental Station at Scott, Sask., in addition to 14 Associations under the supervision of the Dominion Experimental Station at Lethbridge, Alta. The area served by these Associations includes all of the territory between the Red Deer River on the south and the Battle River on the north and extends westward for about 14 ranges from the Saskatchewan boundary. A large part of this territory is better suited to the production of live stock than of cereals.

The program of the Board for 1938 included:

1. The establishment of a tuberculosis-free area for cattle, covering some 340 townships, a project which would greatly facilitate the shipment of feeder stock to Eastern Canada. Considerable progress has been made with this project, and a petition signed by 4000 members of associations for the legal institution of this tuberculosis-free area has been presented to the Government of Alberta.

2. The elimination of warble flies in cattle is the object of cooperative work by several Associations which met with considerable success in 1938.

3. The elimination of bot-flies in horses will be attempted throughout the Board Area.

4. The use of a community auction sale as a means of marketing live stock, a procedure which has already proved satisfactory.

5. Setting up approved sire areas with assistance from the Production Service of the Dominion Department of Agriculture.

The success which may be reasonably expected to attend the foregoing program should promote to a considerable degree the rehabilitation of agriculture in the drought area of Central Alberta.

Other live stock activities - In a number of Associations in Central Saskatchewan attempts were made to control bovine tuberculosis, though as yet on a smaller scale than in Alberta.

In East Central Alberta, swine improvement through the introduction of good breeding stock has been undertaken by the Langham and Sounding Creek Associations.

Educational - Agricultural short courses under the Dominion-Provincial Youth Training Program were presented as part of the work of the Langham and Eye Hill Associations in Saskatchewan. General meetings called for discussion of some particular problem have been well attended. The Cando Association organized a successful "motorcade" to Scott, where the experimental work on the Dominion Experimental Station was examined.

Agricultural Improvement Associations in Southern Alberta

In the district served by the Lethbridge Station, there are 29 Agricultural Improvement Associations with 3248 members. During the past year 9 new Associations have been formed, and the membership increased by 1325.

In addition to the distribution of grass seed for seed plots, tree planting, and water development, the Associations throughout southern Alberta engaged during 1938 in a number of rehabilitation activities.

Soil drifting control - A considerable amount of cooperative soil drifting control work has been conducted during the past year by Associations. In this manner, drifting in the spring of 1938 was controlled on approximately 2000 acres in the Bindloss district, on 250 acres in the Cereal district, and on a number of other areas throughout southern Alberta where drifting was beyond the control of individual farmers. The method commonly followed in this work consisted of listing in strips in alternation with strips of spring seeding, the listed areas checking drifting until the crops became established. To farmers cooperating in this work the Dominion Experimental Station at Lethbridge supplied 25 sets of lister shovels for attachment to ordinary cultivators.

Grass seed distribution - The policy of distributing small lots of registered grass or clover seed to members of Associations, for establishing farm seed plots, was continued in 1938. The total amount distributed in 1938 to 1036 members was 16,080 pounds of crested wheat grass, 1900 pounds of sweet clover, and 380 pounds of brome grass, or a total of 18,360 pounds of seed.

Aside from the grass seed distributed, an effort was made to meet the requirements of certain districts for cereal seed for forage production. To this end, 20 members in each of the Garden Plains and Sibbald Associations were supplied with two bushels of good quality fall rye seed, on the understanding that each recipient must, if possible, return four bushels of seed to the Association. This program would provide for increased distribution of rye seed in the fall of 1939.

Insect control - Much consideration has been given to the organization through Agricultural Improvement Associations in southern Alberta, of cooperative attacks on insect pests, particularly the western wheat stem sawfly, Say's grain bug and the pale western cutworm. In this connection, the staff of the Dominion Entomological Laboratory at Lethbridge has assisted very considerably in giving information on insect control through meetings and field work, to members of Associations.

Special sawfly control projects - The increased damage to wheat from sawflies which accompanies strip farming may be controlled by sowing buffer strips of brome grass around wheat fields. This control method has been adopted by several associations as cooperative measures. Thus the Grasswold Association at Rockyford initiated a program of seeding down brome grass on all road allowances in the Rural Municipality of Grasswold. This program has since developed

into a cooperative project between the Municipality and the P.F.R.A. authorities. A total of 812 miles of road allowance has been seeded, requiring a total of 18,662 pounds of brome grass seed. It is hoped that this project will furnish information as to the possibility of controlling sawfly in a strip-farmed area by the methods used.

Similar sawfly control projects have been undertaken by the Orkney Association at Morrin, involving 7.8 miles of brome grass buffer strips, and on a smaller scale by the Marquis Association at Milo.

Seed for the foregoing project, and supervision of seeding, are provided by the Dominion Experimental Station at Lethbridge.

Live stock improvement - Many of the Agricultural Improvement Associations in southern Alberta have been organized in areas where much of the land is marginal or submarginal for wheat. For this reason, efforts have been made through these Associations to improve conditions with respect to the production and marketing of live stock.

The Neutral Hills Livestock Board - Great impetus was given to live stock work in Alberta by the formation, in 1937, of the Neutral Hills Live Stock Board, more fully described in the accompanying report on P.F.R.A. Cultural Activities in East-Central Saskatchewan and Central Alberta (see page 30). During the past year 14 of the Associations supervised from Lethbridge were affiliated with 13 associations in the Central Alberta to form the Neutral Hills Live Stock Board.

Other live stock activities - Aside from the work of the Neutral Hills Live Stock Board, there has been considerable live stock activity among Associations in Southern Alberta. Associations at Delia, Hanna, and Rose Lynn have undertaken to restock farms in their respective districts with pure-bred Yorkshire hogs under the Swine Improvement Policy of the Dominion Department of Agriculture. The Pope Lease Association at Carbon has organized a bull club, the Progress Association at Castor has sponsored a junior beef-calf feeding club, and stallion clubs have been organized in several localities.

Seed improvement - Very mixed wheat crops throughout the drought area of southern Alberta have resulted from the distribution of mediocre relief seed. Efforts to improve the quality of wheat are being made through the Associations. In 1938, more than 10,000 bushels of good seed wheat, produced on District Experiment Sub-Stations, were distributed to members of Associations.

Conclusion - From the foregoing brief report it will be seen that Agricultural Improvement Associations in southern Alberta have engaged in a wide diversity of rehabilitation activities and that the great majority of Association members are learning the art of cooperation to an ever-increasing degree.

PROGRESS OF P.F.R.A. WORK AT THE DOMINION FORAGE CROPS LABORATORY, SASKATOON, SASK.

Work carried on at this laboratory under the P.F.R.A. consists largely of the breeding of forage plants suitable for dry land agriculture, the propagation of selected forage varieties, and experiments in seeding perennial grasses and legumes. Progress made during the past three months in these lines of work is noted below.

Plant Breeding - Progress is being made in the development of creeping rooted types of alfalfa which would be useful in soil drifting areas. Plants set out in the spring are becoming fairly well established and, in some cases, display desirable characteristics.

Work is also proceeding in cross-breeding of various species of Triticum (Wheat) and Agropyron (Rye grass genus). The object of this work is to secure large-seeded, perennial grasses which can be seeded at some depth to secure moisture.

Propagation of seed

Good yields were secured in 1938 from foundation plots of Fairway crested wheat grass, Parkland brome grass (non-creeping roots) and Alpha sweet clover. This seed will provide a reliable source of supply for Elite Stock seed growers. A foundation stock plot of Arctic sweet clover was also sown this year.

Experiments in seeding perennial grasses and legumes

In dates of seeding experiments at Saskatoon, western rye grass, brome grass and crested wheat grass have been sown at intervals of two weeks throughout the spring, summer and fall. Results secured in this work during 1938 and previous years demonstrate the importance of early spring seeding of these grasses and particularly of crested wheat grass. Brome and western rye grass have given satisfactory stands when sown on dates later in the spring than were satisfactory for crested wheat grass.

On sandy land at Beaver Creek, Sask., the importance of fall seedings of crested wheat grass were demonstrated by the results of seedings made on September 10th and October 10th, 1937, and on April 20th, 1938. Of these seedings only the fall sown plots have survived, and these have given excellent results. Sweet clover and alfalfa sown in October, 1937, and in April, 1938, failed to establish stands.

SEED SUPPLIES FOR RECLAMATION AND REGRASSING

Supplies of grass and legume seed for reclamation and regrassing projects, as well as for distribution through Agricultural Improvement Associations are secured through the purchasing facilities of the Dominion Seed Branch. The total amounts of seed purchased for these purposes during the fiscal year 1938-39, and for the four years ending March 31, 1939, are shown below.

Purchases of grasses and clovers for Prairie Farm Rehabilitation cultural work to March 31, 1939

Item	Total for years 1935-36 1936-37 1937-38	1938-39	Total 4 years to March 31, 1939
Grasses	lb.	lb.	lb.
Crested wheat grass	330,281	149,970	480,251
Brome grass	83,340	66,150	149,490
Western rye grass	13,690	2,000	15,690
Timothy	1,000	500	1,500
Reed Canary grass	650	700	1,350
Creeping red fescue	1,000	600	1,600
Sudan grass	300	-	300
Mixed brome and western rye grass			
Slender wheat grass		3,000	3,000
Red top		200	200
Legumes			
Alfalfa	56,810	46,150	102,960
Sweet clover	109,200	58,500	167,700
Alsike	500	500	1,000
Total grasses and legumes	609,271	328,270	937,541

PROGRESS OF TREE PLANTING UNDER THE PRAIRIE FARM REHABILITATION ACT

Supervised from the Forest Nursery Station, Indian Head, Sask.

Tree planting, with the object of improving living conditions on prairie farms, and of providing protection for gardens and crops against the erosive and drying effects of high winds, is being undertaken as part of the rehabilitation program.

Afforestation on the naturally treeless prairies is beset with difficulties arising principally from adverse climatic conditions, and also from the lack of suitable planting stock. In order to assist farmers in overcoming these difficulties, the Dominion Government established Forest Nursery Stations at Indian Head, Sask., in 1901 and at Sutherland, Sask., in 1914. The purpose of these stations was to determine the best methods of establishing tree plantations on the prairies, and to produce and distribute suitable planting stock to farmers throughout the Prairie Provinces. Since 1930, this work has been part of the Dominion Experimental Farms service. Prior to the inauguration of the rehabilitation program in 1935, over 150,000,000 trees had been supplied free to between 60,000 and 65,000 farmers. Since 1935, over 6,000,000 trees have been distributed under the rehabilitation program, in addition to large quantities distributed in those parts of the Prairie Provinces which lie outside of the P.F.R.A. area.

Weather conditions - Generally, weather conditions during the spring and early summer of 1938 were very favourable for tree planting in the P.F.R.A. area. As a result most plantations got a very good start and the survival at the close of the season was satisfactory.

Insect attacks - Grasshoppers were very injurious to shelterbelts in southeastern Saskatchewan and southwestern Manitoba. Blister beetles were also very prevalent. In August most of the caragana in these districts was badly defoliated but judging from past experience it is not expected that any serious injury, other than reduced growth, will result.

An extremely severe infestation of grasshoppers on the Indian Head Nursery Station caused damage to seedlings in the propagation plots unparalleled since the establishment of the station. So severe was the damage that the estimated production of five million plants was cut to less than one and one-half million. As a result, allotments for planting in 1939 have had to be greatly reduced, an unfortunate necessity in view of the improved conditions and increased interest in tree planting. Fortunately, conditions at the Sutherland Nursery Station have been very favourable.

The nature and progress of various P.F.R.A. tree-planting activities is described below.

District Experiment Sub-Stations

On each Sub-Station a farm home shelterbelt for the protection of buildings and gardens is established for demonstration purposes. For this work, free trees plus financial assistance in planting, fencing and maintenance is provided. During 1938 the number of seedlings supplied to Sub-Stations was 58,265.

Agricultural improvement associations

Members of these associations may receive a limited number of trees delivered free to the nearest railway express station. Until December 31st, 1938, a grant of $3.50 per thousand trees to a maximum

of 10,000 trees, was made to members to cover the cost of planting. Since that above date, this financial assistance has been discontinued, to be replaced by the payment of express on all trees shipped to farmers in the P.F.R.A. area. The number of trees distributed through Agricultural Improvement Associations in 1938 was 908,886.

Field crop shelterbelt associations

The work of these Associations constitutes a very interesting phase of the rehabilitation program. Field Crop Shelterbelt Associations comprise groups of farmers, located in compact groups of farms in selected districts, who have undertaken with government assistance to plant shelterbelts of hedges, largely caragana, around their crop fields. The object of this work is to determine to what extent a fairly extensive system of shelterbelts will exert a beneficial effect on crop production by reducing the erosive and drying effect of high winds and by retaining snow on crop land. Farmers associated with the government in this work receive free planting stock, as well as financial assistance for planting and maintenance. This work, which is of a purely experimental nature, and may require many years for the demonstration of results, is at present confined to selected areas at Lyleton, Man., Aneroid, Sask., Conquest, Sask., and Porter Lake, Alta. Progress already made with this work is shown in the following table.

Progress of Planting in Field Crop Shelterbelts Associations under the P.F.R.A.

Field Crop Shelterbelt Association	1935 to 1937 incl.	1938	Total 1935 to 1938 inclusive		Proposed for 1939	
	Seedlings planted	Seedlings planted	Seedlings planted	Miles of hedge	Seedlings distributed	Miles of hedge
Lyleton, Man.	380,025	483,725	863,750	165.5	279,300	58.5
Aneroid, Sask.	100,255	100,350	200,605	23.5	72,975	14.5
Conquest, Sask.	1,465,750	1,061,900	2,527,650	316.0	507,150	47.0
Porter Lake, Alta.	74,985	52,425	127,410	20.5	23,075	2.5
	2,021,015	1,698,400	3,719,415	525.5	882,500	122.5

From the foregoing table it will be seen that a total of 3,719,415 seedlings have been planted by four Shelterbelt Associations to form 525.5 miles of hedge. Seedlings already distributed for planting in 1939 will increase the total of seedlings planted to 4,601,915 and the total length of hedges to 648 miles.

In cooperation with the Provincial Highways Department, hedges are being planted as snow fences along some 75 miles of highway in Manitoba. This work was started in 1937. In 1938, 188,000 seedlings were supplied for this purpose, and by 1939 the total number will have reached the 400,000 figure.

Trees to the number of 36,700 have been planted on the Reclamation Station at Melita, Man., and an additional 2,025 will be planted in 1939.

Preparations have been made for tree-planting work on the Val Marie Irrigation Project in Saskatchewan.

Summary - The following table presents data of the number of seedlings supplied for various P.F.R.A. projects.

Number of Tree Seedlings Distributed under the P.F.R.A.

Distributed to	1935 to 1937 inclusive	1938	Total 1935-1938 inclusive	Distributed for planting in 1939
District Exp. Sub-Stations	173,200	58,265	230,465	41,379
Agr. Imp. Assns.	814,270	908,886	1,723,156	1,343,275
Field Crop Shelter-belt Assns.	2,021,015	1,698,400	3,719,415	882,500
Other P.F.R.A. Projects	323,075	154,150	477,225	72,025

SOIL RESEARCH

Soil research under the rehabilitation program includes a comprehensive group of investigations into fundamental problems affecting dry-land farming. The bulk of this work is conducted at the Soil Research Laboratory on the Dominion Experimental Station, Swift Current, Sask. In addition, special research work covering specific soil problems, are being conducted in cooperation with the Soils Departments of each of the provincial universities.

Work of the Soil Research Laboratory, Swift Current, Sask.

This laboratory was established under the P.F.R.A. in 1936. Equipment is available for fundamental research into the physical and chemical properties of soils. A brief outline of the work in progress, together with some of the findings to date, is presented below.

Soil moisture investigations - Experiments to determine the relationship between soil moisture and plant growth, under various cropping and cultural conditions, have been in progress at Swift Current since 1922. These experiments with revisions and additions, now form part of the work of the Research Laboratory. A bulletin embodying the results of these experiments, entitled "Soil Moisture and Crop Production under Dry Land Conditions in Western Canada" was published in January 1938, as Publication No. 595 of the Dominion Department of Agriculture.

Influence of tree shelterbelts on crop yields - Investigations to determine the influence of field crop shelterbelts of trees on the yields of crops grown on adjacent land have been in progress for some years. The object of this work is to learn to what extent the yields of crops can be increased in the semi-arid regions of the Prairie Provinces, by the accumulation of snow near shelterbelts during winter months, and by checking evaporation during the summer months. Results secured in this work during 1938 are presented in the following table. In this table are presented the average yield per acre of wheat and oats secured at different distances from shelterbelts. With the exception of the work done on the Dominion Experimental Station at Scott, Sask., the tabulated results were secured by workers from the Soil Research Laboratory. The data from Scott are included to make a complete record.

Influence of Tree Shelterbelts on Crop Yields - 1938

Location of shelterbelt	Description of area sampled	Crop yield per acre at different distances from belt								
		Crop	Distance of sampled points from belt in feet							
			12'	25'	50'	75'	100'	150'	200'	250'	300'
Bridgeford, Sask.	Sampled east of N-S*1 hedged 5' high	Wheat, grain, bu.		14.0	19.1	12.8	9.2	7.1	7.7	8.4	
	Rust near belt	*3 total, tons		1.55	1.66	1.32	1.03	.95	.97	.95	
Sanctuary, Sask.	Sampled east of N-S belt 9' high	Wheat, grain, bu.	26.9	27.9	18.6		4.2	4.7			
		total, tons	2.16	2.14	1.33		.47	.51			
Conquest, Sask. Kennedy Farm	Sampled west of N-S belt 12'-20' high	Wheat, grain, bu.		7.0	11.7	10.5	9.6	9.1	8.5	8.4	9.9
	A little rust damage	total, tons		1.90	1.60	1.21	1.09	1.05	.86	.88	.94
Conquest, Sask. Kennedy Farm	Sampled north of E-W*2 belt 13' high	Wheat, grain, bu.		6.5	9.3	10.7	9.7	11.5	10.6	10.3	11.3
	Considerable rust near belt	total, tons		1.47	1.58	1.56	1.26	1.34	1.26	1.24	1.24
Conquest, Sask. Kennedy Farm	Sampled east of N-S belt 10'-12' high	Wheat, grain, bu.		5.5	/7.6	6.0/	7.8	6.8	7.1	8.0	
	A little rust damage near belt	total, tons		1.45	.87		.80	.79	.80	.78	
Conquest, Sask. Fletcher Farm	Sampled east of N-S belt 12'-20' high	Wheat, grain, bu.		3.3	14.8	12.8	9.0	9.7			
	Grain badly rusted	total, tons		2.60	2.13	1.28	.97	.86			
Harris, Sask.	Sampled east of N-S belt 8'-12' high	Wheat, grain, bu.		10.8	9.7	8.6	8.1	9.5	9.0	8.4	
	Grain badly rusted	total, tons		2.39	1.83	1.32	1.27	1.22	1.26	1.08	

*1 N-S = North to South

*2 E-W = East to West

*3 Total = yield of grain and straw

(continued)

Influence of Tree Shelterbelts on Crop Yields (continued)

Location of shelterbelt	Description of area sampled	Crop yield per acre at different distances from belt								
		Crop	Distance of sampled points from belt in feet							
			12'	25'	50'	75'	100'	150'	200'	250'	300'
Scott, Sask.	Sampled east of N-S belt on Dominion Experimental Station	Wheat, rust resistant, bu.	40.6	40.0	32.0	21.0	23.6				
		Wheat, mod. resistant, bu.	33.3	33.9	27.8	19.7	20.4				
		Wheat, rust susceptible, bu.	23.8	27.7	24.8	17.5	22.8				
Hodgeville, Sask.	Sampled east of N-S belt 8'-10' high	Oats, grain, bu.	40.0	45.8	32.7	19.1					
		total, bu.	1.80	1.77	1.27	.87					
Scott, Sask.	Sampled east of N-S belt on Dominion Experimental Station	Oats bu.	42.8	47.8	56.4	41.6	41.3	33.6	27.7		

In the information tabulated above, the following points may be observed:-

1. With wheat at Bridgeford and Sanctuary, and with oats at Hodgeville, the influence of shelterbelts in increasing the yield of both grain and total crop is evident.

2. At Conquest and Harris, grain yields show little evidence of shelterbelt influence, apparently due to the presence of rust. Total crop yields, on the other hand, are higher near the shelterbelts than at some distance therefrom.

3. No data on total crop yield are available for Scott. At this Station, however, beneficial influence of shelterbelts on the yield of grain of wheat and oats is evident.

4. Damage to grain yields by rust seems to have been greater within 25 feet of the shelterbelts, than at greater distances. This tendency, probably due to better moisture conditions near the shelterbelt, is particularly noticeable with wheat at Scott, the amount of damage attributed to rust near the shelterbelt being in direct proportion to the rust susceptibility of the variety sown.

5. The protective influence of the shelterbelts as indicated by crop yields, extends to from about 75 feet to 200 feet into the grain fields.

6. Sufficient data are not yet available to determine the relationship between height of belt and depth of protected zone.

Soil drifting studies - Measurements of the susceptibility of soil to drifting under different cultural treatments were made in 1938 with laboratory and field wind tunnels. In these experiments the average amount of soil blown away from a bare surface by a fairly strong wind was reduced by 61 per cent where small ridges were cultivated at right angles to the direction of the wind; by 86 per cent where straw at the rate of one-half ton per acre was incorporated in the surface soil; and by 94 per cent where both ridging and straw were used. These results help to account for the efficacy of listing for drift control, and indicate the importance of organic fibre for soil binding.

Further laboratory and field experiments have indicated that a pulverized soil can be changed to a granulated or cloddy condition which resists drifting by cultivation when sufficiently moist. It has been possible to retain this granular condition throughout the season with fair resistance to drifting.

Soil fertility - A considerable amount of work is being done to determine the relationship between the chemical composition of soils and the response of crops to fertilizer treatments. In this connection, a number of pot culture experiments are being conducted in the greenhouse with soils which have been damaged by drifting. The effect of salt concentration and fertilizer treatment on the irrigated soils of Val Marie, Sask., is also being studied in pot cultures.

Weed investigations - Studies on the factors affecting the dormancy period of weed seeds, and the relationship of dormancy to eradication measures, are in progress. Chemical methods of weed eradication are also being studied. In connection with these investigations, a weed herbarium is being assembled.

Routine work - During 1938, the Soil Research Laboratory received approximately 4000 samples of fodder, for dry matter determinations, and 3000 samples of soil for moisture determination, in connection with various investigations in progress on Dominion Experimental Farms and Stations in the Prairie Provinces. In addition, 50 samples of soil and water were received from farmers interested in irrigation problems.

Some time has been devoted to the determination of the selenium content of various plants, in connection with studies on the selenium poisoning of live stock.

Special Soil Research at the Provincial Universities

Investigations on three important soil problems have been undertaken in cooperation with the soils department at each of the three provincial universities in the Prairie Provinces. By means of this cooperative arrangement, use has been made of the facilities of these institutions for the investigation of pressing soils problems, without unnecessary duplication of effort.

The problem investigated at each university is discussed below.

University of Manitoba - "The Quality and Composition of Crops as Influenced by Soil Type, Fertilizer Treatment, Crop Sequence, and Climatic Conditions". These investigations are directed by Professor J.H. Ellis, Soils Department, University of Manitoba, Winnipeg, Man.

This investigation has been confined to the analysis of crops grown in recent years on Red River clay. The analyses show that seasonal conditions have a greater effect on the quality of crops than any other factor, as judged from the protein content. In any one year, however, manure and a preceding crop of legumes has significantly increased the protein content of wheat. Small amounts of fertilizers have not significantly affected the composition of grain crops.

University of Saskatchewan - "The Nature and Treatment of Alkali Soils".

The following summary of these investigations was prepared by Dr. J.B. Marshal of the Department of Soils, University of Saskatchewan, Saskatoon, Sask.

The investigations on the nature and treatment of "alkali" soils have been directed, in general, toward establishing limits of tolerance for the important western crops. Field and greenhouse experiments have been used as well as a more general survey. The following report gives an outline of the work done and a brief summary of the results.

An examination of some samples of shale from Val Marie, Saskatchewan, has been made in order to obtain information on the source and nature of the salts in the soil of the irrigation projects at that place.

A paper on "Changes in the nature and position of the soluble salts in certain Alberta soils after twenty years of irrigation" has been published in Scientific Agriculture for January 1939 with A.E. Palmer of Lethbridge.

The survey commenced in 1936 of the nature and distribution of water soluble salts in Saskatchewan soils has been continued. Samples of surface and subsoils have been secured from areas affected by salinity and from adjacent areas growing healthy crops. Approximately 150 samples have been examined. The average soluble salt contents (1: 5 water extracts) of these are given in the following table, the data being grouped on a crop basis. The healthy areas are usually very sharply demarcated in the field and these results indicate the very abrupt change in salt content.

Crop	No. of samples pairs	Limit of tolerance		Area of good growth	
		0 - 6"	6 - 12"	0 - 6"	6 - 12"
Wheat	18	1.39	1.50	0.38	0.40
Oats	7	1.59	1.51	0.35	0.63
Barley	7	1.78	1.63	0.46	0.88
Flax	1	1.20	1.43	0.39	1.25
Crested wheat grass	1	1.69	1.81	0.28	0.85

Calcium, magnesium and sodium sulphates are predominant salts. Chlorides are seldom found in more than detectable quantities and black alkali or sodium carbonate soils are infrequent.

The above data are in agreement with the generally accepted views on the relative abilities of wheat, oats and barley to grow on saline soils and with data secured from plot test of varieties of these crops on the Dominion Illustration Station at Hafford. The plots were located on a saline flat that is subject to spring floods. Drainage is poor and there is a high water table.

Sample	Depth	Growth failed	Limit of tolerance	Mod. good growth
Wheat				
Marquis	0-6"	2.68	1.81	1.01
	6-12"	1.98	1.39	0.68
	12-18"	1.45	1.46	0.47
Pelissier	0-6"	1.93	1.46	1.04
	6-12"	1.41	0.97	0.53
	12-18"	1.01	0.90	0.36
Oats				
Banner	0-6"	2.27 thin	0.70 moderate	0.69 good growth
	6-12"	1.41 stand	0.78 stand	0.50
	12-18"	1.22	0.76	0.50
Gopher	0-6"	2.31	1.62	0.97
	6-12"	1.30	1.10	0.66
	12-18"	1.28	1.24	0.47
Barley				
Regal	0-6"		2.83	1.40
	6-12"		1.05	0.82
	12-18"		0.72	0.47

These data do not differentiate between Marquis and the Durum wheat nor the two oat varieties, but they do indicate differences between the crops.

Preliminary greenhouse tests of Thatcher and Marquis wheats for tolerance to different concentrations of magnesium and sodium sulphates have given promising results as shown in the third table.

Number of heads threshed and yields of grain for Marquis and Thatcher wheats grown in soil cultures with varying concentrations of magnesium and sodium sulphates.

	Magnesium Sulphate				Sodium Sulphate			
	0	1	2	3x	0	1	2	3x
Marquis								
No. of heads	74	71	17	4	66	64	5	1
Yield of grain	10.50	12.36	3.84	1.86	8.53	11.35	0.85	0.27
Thatcher								
No. of heads	71	79	32	12	68	68	18	3
Yield in grams	9.60	12.55	10.98	4.24	9.91	13.02	5.39	0.51

Mean of all 0 treatments 9.64 grams.

x 1, 2, 3% of salt (approximately)

A second crop grown on the same soil during the winter months did not mature. However at the highest rate (i.e. 3) Thatcher again had the greatest number of plants survive. Marquis produced considerably more secondary growth at the lower rates. The soil from each pot is being examined to determine reaction and the actual salt concentrations after two crops.

Thirteen samples of shale from Val Marie were examined by J.E. McClelland, Senior student in soils. Total analyses by fusion were made, and in addition phosphorus, organic matter, and pH were determined. Water extracts were also examined. Very little calcium was found in these samples, either total or water soluble, although large gypsum crystals are commonly found on top of the shale. Sodium and magnesium sulphates were abundant in the water extract. All of these samples had an acid reaction, ranging from less than pH 4 to less than pH 7.

University of Alberta - Soil Deterioration Studies.

The following summary of soil deterioration studies was prepared by Professor F.A. Wyatt, Department of Soils, University of Alberta, Edmonton, Alta.

SOIL DETERIORATION STUDIES

The object of this investigation is to determine the effects cultivation and cropping have had on some of the major soil constituents of some western Canada prairie soils.

Duplicate composite samples of soil, according to profile, were collected from cultivated fields and nearby unbroken land. Drifted landswere avoided as much as possible, the effects of drifting on soils being a study in itself outside the scope of this work. Samples were then taken to the laboratory, finely ground and analysed chemically.

Up to the present well over 600 samples have been collected from scattered points in the various soil zones of Alberta, Saskatchewan and Manitoba. Samples were taken chiefly in Alberta in 1936, Saskatchewan in 1937, and Manitoba in 1938.

All samples collected have been analysed for nitrogen and carbon, the surface and subsurface samples for total phosphorus, the surface samples for acid soluble or easily soluble phosphorus, and a few samples for total potassium. In addition to this, nitrification studies have been made on the samples collected in 1936, and water soluble phosphorus content is now being determined on all surface samples.

A paper on this work was presented at the Canadian Society of Technical Agricultures' Convention in 1938, and published in Scientific Agriculture, Vol. 19, 5:258-270. It has been shown that there have been losses of nitrogen and carbon in varying amounts in different localities, as a result of cultivation and cropping. The surface 6 inches of cultivated black, dark brown, brown, and gray soils have lost on the average approximately 20% to 40% of the original nitrogen and organic matter. It was calculated that approximately 1/3 to 1/2 of the average nitrogen loss from the surface soil was due to crop removal. Smaller average losses have occurred in the 6-12 inch depth, and below this depth losses or gains have not been established. Analysis of samples more recently collected has further substantiated this finding.

Nothing has been published as yet, nor any definite conclusions drawn from other analyses made.

Since a loss of nitrogen and carbon has been established it is our object now to try and determine whether the greater part of this loss occurs soon after breaking or occurs progressively as time goes on. To do this it will be necessary to collect samples from fields of various lengths of time of cultivation. Most of the samples already collected have been from the oldest fields that could be located.

It would be interesting and instructive to complete nitrification studies on samples collected, because differences in rates of nitrification between cultivated and virgin soils have been found in the samples already analysed.

A study of base exchange relations and analysis of samples for sulphur might throw further light on the effects of cultivation and cropping on plant nutrients in the soil.

SOIL SURVEY

With the object of making an inventory of soil resources in the Prairie Provinces, the nature, location, and extent of the various soil types is being determined through soil surveys. This work has been in progress for a number of years, in many cases as a co-operative project between the provincial agricultural colleges and the Dominion Experimental Farms. Under the rehabilitation program efforts are being made to complete this work for the entire drought area, in order to supply data for agricultural, land utilization and resettlement purposes.

In general, the procedure being followed in this work is to make a reconnaissance survey of the entire drought area, in which soils are mapped on a fairly broad classification. The reconnaissance survey is followed by more detailed surveys of areas presenting special problems, especially where irrigation is contemplated or reclamation is necessary.

Reconnaissance soil surveys have been made of approximately 90 per cent of the area coming under the operations of the Prairie Farm Rehabilitation Act.

Soil Survey in Manitoba - During the past year 2,730,600 acres were covered by the reconnaissance soil survey of southern Manitoba. The total area covered to date is 9,942,120 acres lying between the Red River and the Saskatchewan boundary. Practically all of the drought area of Manitoba has been covered by soil surveys.

Soil Survey in Saskatchewan - Detailed soils surveys were conducted during 1938 on a number of prospective irrigation areas, a total of 63,000 acres being covered.

Previous soil survey work in Saskatchewan included a reconnaissance survey of the province as far north as Prince Albert, some 64,000,000 acres being covered. The report and maps for this survey were published in 1936, Soil Survey Report No. 10, by the provincial agricultural college at Saskatoon, with assistance from the Dominion Experimental Farms. During 1936 additional reconnaissance work was done in the area north of Prince Albert, and detailed surveys were made of severely drifted areas around Nortlach and Cadillac as well as on the new irrigation projects at Val Marie and Eastend.

During 1937 detailed soil surveys were made of six municipalities in the Nortlach - Chaplin - Gravelbourg area, approximately 1,000,000 acres being covered. In this survey information on soil erosion, topography, stoniness, etc., was obtained, in addition to data on soil types. As the six municipalities concerned had previously been covered by farm management studies by the University of Saskatchewan, the additional information on soils should enable specific recommendations to be made regarding the use and disposition of the lands involved. In addition, detailed Surveys covering a total of 43,850 acres, were made on several areas on which irrigation developments are in progress.

Soil Survey in Alberta - The reconnaissance soil survey of the drought area in this province was continued during 1938 in the Lethbridge and Milk River districts, some 3,130,000 acres being covered. Altogether, 18,730,000 acres in the drought area of Alberta have been covered by soil surveys, leaving approximately 7,000,000 acres yet to be surveyed.

APPENDIX I

STATISTICS RELATIVE TO THE P.F.R.A. AREA IN COMPARISON WITH THE ENTIRE PRAIRIE PROVINCES

P.F.R.A. area of Sept., 1938

Based on Census of 1931

	P.F.R.A. area	Three Prairie Provinces	Percentage P.F.R.A. to total Prairie Provinces
Total land area	103,300,000	452,158,720	22.8
Occupied land acres	78,758,213	104,782,602	71.7
Improved land acres	46,813,072	59,819,436	78.3
Unimproved pasture	26,169,309	35,317,158	74.1
Population			
Rural	815,166	1,468,147	55.5
On farms	702,696	1,186,608	59.2
Number of Farms	171,622	288,079	59.6
Live stock (Census of 1936)			
Horses	1,157,459	1,884,243	61.4
Cattle	2,234,915	3,836,461	58.3
Sheep	935,885	1,283,732	72.9
Production of Major Crops, 1921-1937			
Wheat bu.	4,122,943,951	5,618,798,000	73.4
Oats bu.	2,537,816,712	3,997,892,000	63.5
Barley bu.	702,685,641	1,165,568,000	60.3
Value of Major Crops 1921-1937			
Wheat $	3,238,859,730	4,318,312,000	75.0
Oats $	768,100,026	1,185,032,000	64.8
Barley $	296,884,482	485,875,000	61.1
TOTAL $	4,303,844,238	5,989,219,000	71.9

APPENDIX II

AGRICULTURAL IMPROVEMENT ASSOCIATIONS
under the
PRAIRIE FARM REHABILITATION ACT
as of March 31st, 1939

SOUTHWESTERN MANITOBA - Supervised from the Dominion Experimental Farm, Brandon, Man.

Association	Headquarters	Secretary	Members
Sifton-Pipestone-Alberta	Reston	Geo. Wilson, Reston	625
Pierson	Pierson	Guy Graven, Pierson	151
Goodlands	Goodlands	Fred Morningstar, Goodlands	106
North Brenda	Medora	J.Ewart Mills, Medora	141
Lyleton	Lyleton	Wm. J. Murray, Lyleton	131
Waskada	Waskada	E.T. Temple, Waskada	104
Boissevain	Boissevain	Fred Musgrove, Boissevain	198
Killarney	Killarney	P.C. Raymer, Killarney	299
Deloraine	Deloraine	J. Wat. Thomson, Deloraine	86
Melita-Arthur	Melita	Harry L. Morrow, Melita	83
Louise	Crystal City	J. Allan Beavis, Crystal City	316
Hartney	Hartney	L.V. Robson, Deleau	242
Wallace	Elkhorn	H.J. Jones, Elkhorn	400
Assiniboine-Delta	Treherne	J.D. Scott, Treherne	133
Roblin	Cartwright	A.B. Fee, Cartwright	94
Souris District	Souris	Allan Barclay, Souris	164
Glenboro	Glenboro	W.W. Douglas, Glenboro	76
North Cypress	Carberry	Percy Olmstead, Gregg	196
Archie	Manson	P.S. Rose, Manson	109
			3654

SOUTHEASTERN SASKATCHEWAN - Supervised from the Dominion Experimental Farm, Indian Head, Sask.

To December 31st, 1938

Association	Headquarters	Secretary	Members
Aberdeen	Aberdeen	S.G. Ruby	158
Alameda	Alameda	Harold Desell	96
Assiniboia	Assiniboia	C.W. Coupland	116
Avonlea	Avonlea	E.B. Beckstead	107
Arcola	Arcola	W.D. Duncan	121
Ceylon	Ceylon	J.A. Milligan	189
Colfax	Colfax	Seth Duffus	75
Craik	Craik	F.N. Spencer	97
Grass Valley	Crane Valley	P.L. Jordison	77
Estevan	Estevan	Irwin Dean	661
Kenaston	Kenaston	S.C. Collins	75
Lake Alma	Lake Alma	Frank Wick	100
Minton	Minton	D.B. Fettes	175
Midale	Midale	H.L. Berg	200
Poplar Valley	Poplar Valley	A.S. Dunkinson	108
Radville	Radville	Henry Anderson	134
Readlyn	Readlyn	E.G. Emery	102
Scout Lake	Scout Lake	M. Kissner	90
Souris Valley	Souris Valley	H.F. Holmes	154
Trossachs	Trossachs	J.L. Dodds	129
Union	Union	T.H. Harris	103
Usborne	Usborne	E.D. Gardiner	86
Viceroy	Viceroy	C.H. Oliver	65
Willowbunch	Willowbunch	L. Mondor	106
Weyburn	Weyburn	E.G. Stewart	208
			3532

SOUTHWESTERN SASKATCHEWAN - Supervised from the Dominion Experimental Station, Swift Current, Sask.

Association	Headquarters	Secretary	Members
Abbey	Abbey	G.E. Armstrong	60
Aneroid	Aneroid	A.W. Murray	119
Bracken	Bracken	H.R. Humble	112
Cabri	Cabri	J.A. Johnson	228
Chambery	Chambery	A. Gust	65
Chaplin	Chaplin	F. Kingsmill	141
Claydon	Claydon	A.J. Ross	92
Climax & District	Climax	J.F. Kingston	117
Coulee	Burnham	A.R. Dafoe	142
Frontier	Frontier	E.R. Berg	196
Glen Bain	Glen Bain	G. Williamson	119
Gravelbourg	Gravelbourg	D.D. Piche	256
Gull Lake	Gull Lake	N. McTaggart	123
Hazenmore	Hazenmore	F.H. Bristow	126
Haslet	Roadene	B.C. Bailey	118
Herbert	Herbert	G.W. Francis	216
Horsham	Horsham	F.C. Haskell	107
Kincaid	Kincaid	W.P. Sayers	80
Lafleche	Lafleche	F.H. Bourasse	230
Lac Pelletier	Neville	E.J. English	173
Leader	Leader	E. Frei	60
Leinan	Swift Current	Mrs. J. Benn	65
Limerick	Limerick	W. Smith	125
Linacre	Linacre	G.L. Benn	57
Maple Creek	Maple Creek	J.E. Pickett	390
Mazenod	Mazenod	J.B. Clements	273
Meyronne	Meyronne	G.H. Stephenson	97
Mortlach	Mortlach	A. Eastman	118
Orkney	Orkney	L.B. Nelson	53
Pambrun	Pambrun	A. Ross	97
Pennant	Pennant	C.E. Stutsman	115
Piapot	Piapot	J.S. Armstrong	111
Richmound	Richmound	L.J. Freeman	63
Robsart	Robsart	W.A. Olmsted	137
Rush Lake	Rush Lake	H. Carefoot	77
Senate	West Plains	T.L. Shepherd	86
Shaunavon	Shaunavon	H. Hockett	256
Sidewood	Sidewood	A. Nicol	40
South Swift Current	Swift Current	N. Anderson	62
Success	Success	F.W. Garland	155
Tompkins	Tompkins	E.A. Hallquist	173
Tugaske	Tugaske	R. Wilson	58
Valor	Valor	J. Hindle	67
Vanguard	Vanguard	J.W. Middlemiss	254
Verlo	Verlo	J.E. Pollock	80
Waldeck	Waldeck	G.N. Grayson	65
Eyebrow	Eyebrow	J. Mayor	58
			6012

WEST CENTRAL SASKATCHEWAN AND CENTRAL ALBERTA - Supervised from the Dominion Experimental Station, Scott, Sask.

Association	Headquarters	Secretary	Members
Asquith	Asquith, Sask.	J.L. McCurdy	127
Battleford-Deluas	Battleford, Sask.	E.H. Clink	139
Battle River	Rosyth, Alta.	B.A. Flaade	164
Beechy	Beechy, Sask.	Geo. Urwin	102
Biggar	Biggar, Sask.	H. Nodwell	115
Black Hills	Cousins, Alta.	J. Fisk	105
Blaine Lake	Blaine Lake, Sask.	P.H. Papove	264
Bushville	Springwater, Sask.	F. Freeman	160
Cando	Cando, Sask.	J.F. Hale	207
Cavell	Cavell, Sask.	F.S. Watt	168
Chauvin District	Chauvin, Alta.	H.S. Burton	193
Czar-Hughenden	Czar, Alta.	A.E. Long	138
Douglas	Richard, Sask.	Jack Bradley	230
Eagle Hills	Battleford, Sask.	C.M. Gray	213
Eastern Alberta	Hayter, Alta.	J.D. Richardson	281
Eye Hill	Primate, Sask.	F.J. Finucans	272
Flagstaff	Hardisty, Alta.	T.H. Cooper	158
Gild Edge	Wainwright, Alta.	C.R. Greer	128
Glenside	Baljennie, Sask.	A.C. Edinborough	139
Great Bend	Borden, Sask.	F. Fuller	177
Handel-Kelfield	Handel, Sask.	F. Germsheid	164
Harwell	Flaxcombe, Sask.	B.J. Willey	70
Hillsburgh	Brock, Sask.	J.R. Cooke	141
Hillsdale	Baldwinton, Sask.	A.N. Culham	107
Kindersley	Kindersley, Sask.	D. Fisher	111
Langham	Langham, Sask.	J.G. Stockan	191
Lucky Lake	Lucky Lake, Sask.	L.W. Smith	193
Macrorie	Macrorie, Sask.	H.W. Williams	161
Mantario	Eyre, Sask.	J.C. Watson	96
Mayfield	Maymont, Sask.	S. Dolden	198
Merna	Merna, Alta.	L.V. Smith	176
Metiskow	Metiskow, Alta.	P.R. Kvill	155
Neutral Hills	Consort, Alta.	Art. Redel	345
Newcombe	Glidden, Sask.	H. Stewart	75
North Battleford	North Battleford, S.	H. Gascoigne	104
Parkdale	Hoosier, Sask.	R.F. Werthenbach	80
Parkland	Waldheim, Sask.	L.I. Neufeld	229
Perdue	Perdue, Sask.	N. Andison	138
Radisson	Radisson, Sask.	P.J. Ibbotson	152
Redberry	Refford, Sask.	N. Sulatisky	305
Rosthern	Rosthern, Sask.	S. Roth	176
Royal Canadian	Laporte, Sask.	W.A. Hulton	118
Senlac	Senlac, Sask.	H.E. Holtby	206
Silver Heights	Silver Heights,Alta.	C.A. Stolts	93
Sounding Creek	Sedalia, Alta.	I.P. Opheim	226
South Edgerton	Edgerton, Alta.	W.T. Hays	74
Struan	Struan, Sask.	C.J. McLaughlin	172
Unity	Unity, Sask.	K.P. Cleall	305
Warman	Warman, Sask.	A.P. Born	203
Wilkie	Wilkie, Sask.	W.L. Keith	315
			8559

SOUTHERN ALBERTA - Supervised from the Dominion Experimental Station, Lethbridge, Alta.

Association	Headquarters	Secretary	Members
Acadia Valley	Acadia Valley	Don Graham	111
Argyle-Clear Lake	Claresholm	Eugene O'Neil	88
Bindloss	Bindloss	F. Lydsman	81
Bow Island	Bow Island	F.W. Brown	51
Burdett	Burdett	Ray L. Galvin	191
Byemoor	Byemoor	C.H. Laraway	121
Cereal	Cereal	H.J. Westphal	161
Cessford	Cessford	W.A. McKay	55
Coronation	Coronation	H.L. Selfors	77
Craigmyle	Craigmyle	L.A. Golds	74
Delia	Delia	H.F. Crosweller	93
Enchant	Enchant	Emil Howg	59
Garden Plains	Scapa	R.L. Unsworth	100
Grasswold	Rockyford	C.R. Walrod	138
Hanna	Hanna	J.K. Sutherland	253
Hilda	Hilda	T.S. Montgomerie	65
Hussar	Hussar	Earl Johnson	75
Lomond	Lomond	E.M. Benson	74
Macleod	Macleod	J.L. Fawcett	226
Marquis	Milo	G. Williams	226
Orkney	Ghost Pine Creek	P.F. Bergos	48
Oyen	Oyen	O.E. Samuelson	152
Pincher Creek	Pincher Creek	S. Lunn	119
Pope Lease	Carbon	H.F. Irwin	75
Progress	Castor	C.F. Pals	198
Retlaw	Retlaw	Alf. Rawlins	106
Rose Lynn	Rose Lynn	Harry Gordon	97
Sibbald	Sibbald	A.C. Hoenig	67
Youngstown	Youngstown	R.B. Langley	67
			3248

PRAIRIE FARM REHABILITATION ACT

CULTURAL ACTIVITIES

Statement of Expenditures

for the fiscal year ending March 31, 1932

Activity	Expenditure
Administration	$153,960.23
District Experiment Sub-Stations	74,309.12
Reclamation Stations	47,928.84
Large Scale Grass Seeding	43,828.50
Grass Development Investigations	15,434.89
Pure Seed Grain Production	88,554.53
Tree Planting	36,819.84
Soil Laboratory Investigations	6,862.82
Soil Survey	19,921.75
Soil Research	3,111.51
Special Soil Moisture and Soil Drifting Control Work	33,288.32
Grass Coverage Surveys	3,891.09
Agricultural Improvement Associations	33,063.19
Miscellaneous	13,011.96
Total	$573,986.59

LOCATION OF

DISTRICT EXPERIMENT SUB-STATIONS

UNDER THE PRAIRIE FARM REHABILITATION ACT

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Can
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Report of activities conducted under the Prairie Farm Rehabilitation Act
1938/39

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